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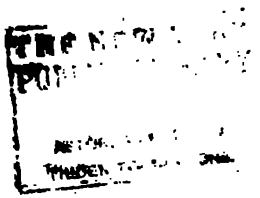

SCIENCE DEPT.

Thos. Dilworth.

THE

SCHOOLMASTER'S

ASSISTANT,

BEING A

COMPENDIUM OF ARITHMETIC,

BOTH

PRACTICAL AND THEORETICAL.

IN FIVE PARTS.

CONTAINING,

I. Simple numbers, wherein
The common rules, having each of them
A different number of questions, with
Answers, are methodically and briefly
Explained.
II. Fractions, wherein several things
Commonly met with, are distinctly
Treated of, and laid down in the most plain
And easy manner.
III. Decimals, in which, among other things,
Is considered the extraction of Roots;
Both simple and compound;
As also Rebate, and Equation of Payments.
IV. A large collection of questions with their answers, serving to exercise the foregoing rules, together with a few others both pleasant and diverting.
V. Duodecimals, commonly called Cross Multiplication; wherein that sort of Arithmetic is thoroughly considered, and rendered very plain and easy; together with the method of proving all the foregoing operations at once, by Division of several denominations, without reducing them into the lowest terms mentioned.

BY THOMAS DILWORTH,

Author of the New Guide to the English Tongue, Young Book-Keeper's Assistant, &c.

REVISED EDITION, WITH ADDITIONS AND IMPROVEMENTS,
ADAPTED TO THE USE OF AMERICAN SCHOOLS,

BY R. TAGART.

NEW-YORK:

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District of New-York, ss.

BE it remembered, That on the eighth day of June, in t
year of the Independence of the United States of America, DANIEL
of the said district, has deposited in this office, the title of a Book, the
he claims as Proprietor, in the words following, to wit: "The Schooln
tant, being a Compendium of Arithmetic, both practical and theor
parts. Containing, I. Arithmetic in whole numbers, wherein all the
having each of them a sufficient number of questions, with their answer
ically and briefly handled. II Vulgar Fractions, wherein several thi
monly met with, are distinctly treated of, and laid down in the most
manner. III. Decimals, in which, among other things, are considered
of Roots; Interest, both simple and compound; Annuities, Rebate, an
Payments. IV. A large collection of questions with their answers, se
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Author of the New Guide to the English Tongue, Young Book-Keeper's
A REVISED EDITION, WITH ADDITIONS AND IMPRO
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If public approbation be a criterion by which to determine the merit of books, none stand higher than this work. For nearly a century it has stood the test; and has perhaps been more used than ALL OTHERS on the same subject. Yet surprising as it may appear, for fifty years past no revised edition has been published; if we except one or two, which, from their numerous variations, may be considered as different treatises. Error has multiplied upon error, in every subsequent, edition, until many parts have become absolutely unintelligible: and the teacher who has not a knowledge of Algebra, sufficient to rectify the theorems, finds it impossible to proceed. For the truth of this, the reader is referred to the various cases of Interest, Annuities, &c. by Decimals.

In this edition the publisher has had every rule and example revised; and many important additions interspersed throughout, necessary for the American arithmetician. And he confidently presents it to the public, impressed with the opinion, that it is as correct as any edition extan

New-York, Nov. 1818.

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THE EXPLICATION

Of some marks, used in this Compendium.

= Two parallel lines are the marks of equality: as 12 *oz.*= 1*lb.* signifies that 12 ounces are equal to 1 pound.

+ Saint George's cross signifies more, or addition, as 4+2 =6: i. e. 4 more 2, are equal to 6.

— A straight line signifies less, or subtraction; as 4—2=2: i. e. 4 less 2, are equal to 2.

× Saint Andrew's cross, denotes multiplication; as 4×2 =8: i. e. 4 multiplied by 2, are equal to 8.

÷ ÷ A line between two points, or between four points, is the sign of division; as, 4÷2 or 4÷÷2=2; i. e. 4 divided by 2, is equal to 2.

)(The reversed parenthesis denotes division also; as 2)4(2: i. e. 4 divided by 2, is equal to 2.

$\frac{4}{2}$ Numbers placed in a fraction like manner, do likewise denote division; the lower being the divisor, and the upper number the dividend.

:: Four points, set in the middle of four numbers, denote them to be proportioned to one another, by the rule of three; as 2 : 4 :: 8 : 16; that is, as 2 is to 4, so is 8 to 16.

N. B. Some masters, instead of points, use long strokes to keep the terms separate, but it is wrong to do so: for the two points between the first and second terms, and also between the third and the fourth, show that the two first and the two last terms, are in the same proportion. And whereas four points are put between the second and third terms, they serve to disjoin them, and show that the second and third, and first and fourth terms, are not in the same direct proportion to each other, as are those beforementioned.

MONEY. *L.* Librae, Pounds. *S.* Solidi, Shillings. *D.* Denarii, Pence. *Qrs.* Quadrantes, Farthings.

$\overline{2+3}\times 5=25$, signifies that the sum of 2 and 3, multiplied by 5, is equal to 25.

$\overline{3-2}\times 5=5$, signifies that the difference between 3 and 2, multiplied by 5, is equal to 5.

$\surd$ Prefixt to any number, supposes that the square root of that number is required. Sometimes it is the sign of irrationality, and signifies that the square root of such a number can never be truly found.

$\sqrt[3]{}$ Prefixt to any number, supposes that the cube root of that number is required. Sometimes it is the sign of irrationality, and signifies that the cube root of such a number can never be truly found.

$3aa+3a$, Signifies 3 times the square of a, more 3 times a.

$3aae+3eea+eee$, Signifies 3 times the square of a, multiplied by e; more 3 times the square of e, multiplied by a: more the cube of e, as is the cube root.

THE SCHOOLMASTER'S ASSISTANT.

PART I.

OF ARITHMETIC IN WHOLE NUMBERS.

INTRODUCTION.

OF ARITHMETIC IN GENERAL.

Q. What is Arithmetic?

A. Arithmetic is the art or science of computing by numbers, either whole or in fractions.

Q. What is number?

A. Number is one or more quantities, answering to the question, How many?

Q. What is arithmetic in whole numbers?

A. Arithmetic in whole numbers, or integers, supposes its numbers to be entire quantities, and not divided into parts.

Q. What is arithmetic in fractions?

A. Arithmetic in fractions, supposes its numbers to be the parts of some entire quantity.

Q. How do you consider arithmetic with regard to art and science?

A. Both in Theory and Practice.

Q. What is Theoretical arithmetic?

A. Theoretical arithmetic considers the nature and quality of numbers, and demonstrates the reason of practical operations. And in this sense arithmetic is a science.

Q. What is Practical arithmetic?

A. Practical arithmetic is that which shews the method of working by numbers, so as may be most useful and expeditious for business. And in this sense arithmetic is an art.

Q. What is the nature of all arithmetical operations?

A. The nature of all arithmetical operations is, by some quantities that are given, to find out others that are required.

Q. Which are the fundamental rules in arithmetic?

A. *These five:* Notation, Addition, Subtraction, Multiplication *and Division.*

OF NOTATION.

Q. WHAT is Notation?

A. It is the art of expressing numbers by certain characters or figures.

Q. What is the use of Notation?

A. Notation teaches us to read and write numbers by their true value.

Q. How many sorts of characters or figures are numbers usually expressed by?

A. Two, viz. the Arabic figures and the Latin letters.

Q. How are Arabic figures expressed?

A. The Arabic figures are thus expressed; one 1, Two 2, three 3, four, 4, five 5, six 6, seven 7, eight 8, nine 9, naught or cipher 0. And this is the notation or reading and writing of every single figure.

Q. How far may the use of these figures be extended?

A. These ten characters or figures may be used to express all manner of numbers, from the least to the greatest, that can be conceived: even without end.

Q. How many figures are sufficient to express most ordinary concerns?

A. Nine; and therefore the table of notation commonly extends no further than to nine places.

Q. Why does it consist of nine places rather than of eight or ten?

A. Because they make up three even periods.

Q. What do you mean by a period?

A. A period is a quantity expressed by three figures whereof the first to the right hand signifies so many units or single things; the second so many tens; and the third so many hundreds.

Q. Why are three figures called a period?

A. Because if the number be increased above three places, there is still the same periodical return of the value of those places, and every third figure to the left hand, will always be hundreds, if it be ever so far extended.

Q. Is an unit or one a number?

A. An unit is a number, because it may properly answer the question, how many?

Q. Give an example or two?

A. How many Gods do we believe? the Answer is one, *How many Sundays* in the compass of a week? Answer one.

Q. In what nature or proportion of value, do numbers *increase from the unit's* place to the left hand?

A. By ten.

Q. How must they be read ?

A. From the left to the right hand.

Q. If two figures are given to be read together, how must they be valued ?

A. The first figure towards the right hand is units, and the next to that is so many tens ; as, 89, eighty-nine. Where 9 is in the place of units, and 8 is in the place of tens ; for eight tens are properly called eighty.

Q. If three figures or a whole period be given, how is it to be valued ?

A. Beginning at the last figure on the right hand, I value them units, tens, hundreds ; as 789, seven hundred and eighty-nine.

Note 1. As every third figure from the place of units, bears the name of hundreds : so for any great sum to be distinguished into periods (as in the following tables) will be of great use to the learner, in the easier valuing and expressing that sum.

2. There is also another sort of periods, which some distinguish thus, viz. millions, millions of millions, &c. and others thus, viz. millions, billions, trillions, &c. each period consisting of six places but as periods of this kind seldom or never occur in business, it is sufficient only to mention them in this place without saying any thing further about them.

TABLE I.

Third Period			Sec'nd Period			First Period		
C. millions	X. millions	millions	C. thous.	X. thous.	thousands	hundreds	tens	units
								9
							8	9
						7	8	9
					9	7	8	9
				8	9	7	8	9
			7	8	9	7	8	9
		9	7	8	9	7	8	9
	8	9	7	8	9	7	8	9
7	8	9	7	8	9	7	8	9

TABLE II.

Third Period			Sec'nd Period			First Period		
C. millions	X. millions	millions	C. thous.	X. thous.	thousands	hundreds	tens	units
								4
							7	3
						9	6	5
					3	4	7	2
				4	8	9	1	3
			7	3	1	2	3	6
		3	1	2	7	1	4	8
	4	3	1	9	2	7	6	4
5	7	3	1	2	9	8	4	2

Note. See the notation of numbers by Latin letters, in the New Guide to the English tongue, page 88.

EXAMPLES FOR PRACTICE.

Write down in proper figures the following numbers, viz.

Twenty-nine.

Three hundred and forty-eight.

Seven thousand, two hundred and twenty-six.

One thousand, three hundred and ninety.

Nineteen thousand, seven hundred and twenty-eight.

Four hundred and twenty-seven thousand, three hundred and ninety-six.

Nine hundred and forty-two thousand, seven hundred.

Four millions, seven hundred and eighty-nine thousand, three hundred and twenty-eight.

Seven millions, nine hundred and forty-two thousand, four hundred and seventy-five.

Twenty-six millions, three hundred and fourteen thousand, one hundred and ninety-five.

One hundred and ninety-seven millions, four hundred and thirty-six thousand, one hundred and ninety-one.

Seven hundred and fourteen millions, one hundred and nineteen thousand, seven hundred and four.

Write down in words at length, the following numbers, viz. 7——19——864——7428——61261——370121——7126172——74680218——461272615.

OF ADDITION.

Q. WHAT is the use of Addition?

A. Addition teaches us to bring several particular numbers into one total sum.

Q. How many sorts of addition are there?

A. Two, viz. simple and compound.

OF SIMPLE ADDITION.

Q. WHAT is simple Addition?

A. Simple or single addition, is the adding of several numbers together, whose signification is the same; as 6 yards and 8 yards, make 14 yards.

Q. If several numbers are given to be added into one sum how are they to be placed?

A. They must be placed in such manner, that units may stand under units; tens under tens &c., pounds under pounds, shillings under shillings, &c.

Q. How do you prove addition?

A. The best way of proving addition is, to begin at the top *of the sum, and* reckon the figures downwards in the same *manner that they* were added upwards: and if the second *line or sum total* be equal to the first, it is right.

EXAMPLES FOR PRACTICE.

L.	*Yds.*	*Gals.*	*Tons.*	*Hhds.*	*lb.*
4	43	764	3746	47476	461743
7	27	347	7436	73712	761780
3	39	387	3406	31819	476332
2	13	736	7398	41243	126722
3	37	397	3373	71208	310748
7	46	473	4731	70956	571388
6	23	382	2264	81465	704714
4	59	769	4731	31269	312624
7	94	367	7169	74196	781462

Miles.	*Leagues.*	*Years.*
4734736	46431734	347312484
3474312	71261374	168126312
2546325	92652724	718125191
7369138	86337266	731618191
3143618	74147312	312134716
4733216	47312614	873263298
2473347	27467573	312614712
3712612	31216126	977647829
5726384	39874129	312814796

OF COMPOUND ADDITION.

Q. WHAT is compound Addition?

A. Compound Addition is the adding of several numbers together, having divers denominations.

1. OF MONEY.

Q. Which are the denominations of English money?

A. 4 Farthings make 1 Penny.
12 Pence —— 1 Shilling.
20 Shillings —— 1 Pound sterling.

Q. Are there no other names of money used in England?

A. Yes: such as,

		l.	*s.*	*d.*
A Moidoire	=	1	7	0
A Guinea	=	1	1	0
A Half Guinea	=	0	10	6
A Crown	=	0	5	0
A Half crown	=	0	2	6

There are also several smaller pieces which speak their o *value, as a six-pence, four-pence, three-pence, two-pe penny, half-penny,* and farthing.

Note. The following pieces were formerly current, but n not so, being only imaginary.

		l.	*s.*	*d.*
A Jacobus	=	1	5	0
A Carolus	=	1	3	0
A Mark	=	0	13	4
An Angel	=	0	10	0
A Noble	=	0	6	8

The pound sterling is also an imaginary sum.

Q. Are there not some tables that may be learned by hea

A. Yes; these following, called pence tables.

d.		*s.*	*d.*		*s.*		*d.*
20	=	1	8		2	=	24
30	=	2	6		3	=	36
40	=	3	4		4	=	48
50	=	4	2		5	=	60
60	=	5	0		6	=	72
70	=	5	10		7	=	84
80	=	6	8		8	=	96
90	=	7	6		9	=	108
100	=	8	4		10	=	120
110	=	9	2		11	=	132
120	=	10	0		12	=	144

FEDERAL MONEY.

Mills.		*Cents.*		*Dimes.*		*Doll.*		*Eagle.*
10	=	1						
100	=	10	=	1				
1000	=	100	=	10	=	1		
10000	=	1000	=	100	=	10	=	1

E. Eagle. $ Dollar. *D.* Dime. *C.* Cent. *M.* Mill

EXAMPLES.

$.	*c.*	*m.*
69	48	3
68	87	8
87	69	6
43	94	9
94	*87*	4

$.	*c.*	*m.*
87	64	3
79	74	8
94	87	7
87	69	9
83	48	4

$.	*c.*
827	43
724	87
694	64
867	86
627	94

EXAMPLES.

[1]			[2]			[3]			[4]		
l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
4	3	6	1	1	3	4	1	$6\frac{1}{2}$	14	12	1
1	7	$8\frac{1}{4}$	3	8	$1\frac{1}{4}$	1	2	7	17	11	$2\frac{3}{4}$
2	7	4	1	1	6	3	1	$4\frac{1}{4}$	19	12	$1\frac{1}{2}$
1	9	$4\frac{1}{2}$	3	4	$7\frac{1}{2}$	3	3	6	16	13	$1\frac{3}{4}$
3	1	$3\frac{1}{4}$	1	2	6	1	4	$1\frac{1}{2}$	12	13	6
1	2	1	3	2	$8\frac{1}{4}$	3	1	2	14	12	$7\frac{3}{4}$
4	7	$6\frac{1}{2}$	7	4	6	1	5	$8\frac{1}{2}$	19	13	4
3	1	9	4	1	$7\frac{3}{4}$	3	1	2	12	11	6

[5]			[6]			[7]			[8]		
l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
19	13	4	47	12	11	21	12	$10\frac{1}{2}$	12	13	10
12	11	6	17	10	11	31	11	$11\frac{1}{2}$	71	16	8
17	14	$1\frac{1}{4}$	18	10	$4\frac{1}{2}$	47	12	$10\frac{1}{4}$	19	4	$6\frac{1}{4}$
19	13	$4\frac{1}{2}$	32	12	6	19	11	4	12	3	1
12	11	6	11	19	4	31	12	$6\frac{1}{2}$	26	1	6
19	13	$1\frac{3}{4}$	12	12	$6\frac{3}{4}$	12	11	$4\frac{3}{4}$	31	11	1
16	12	1	11	13	1	37	11	4	14	12	$6\frac{3}{4}$
19	11	$2\frac{1}{4}$	11	11	$2\frac{1}{4}$	19	11	3	18	12	7

[9]			[10]			[11]			[12]		
l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
44	12	$6\frac{1}{2}$	21	11	$11\frac{1}{2}$	47	12	$6\frac{1}{2}$	47	11	$3\frac{1}{4}$
31	18	$1\frac{1}{2}$	16	12	6	16	19	$11\frac{3}{4}$	31	17	3
47	12	4	11	9	$10\frac{1}{2}$	17	12	$10\frac{1}{4}$	17	12	$11\frac{3}{4}$
14	12	$10\frac{3}{4}$	16	12	$4\frac{1}{4}$	19	12	10	18	14	$10\frac{1}{2}$
16	14	11	34	1	10	17	12	$11\frac{3}{4}$	16	15	11
19	12	2	17	14	$11\frac{1}{4}$	17	19	$4\frac{1}{2}$	17	14	$3\frac{1}{4}$
16	11	3	71	3	$8\frac{3}{4}$	47	13	6	11	11	6
17	11	$1\frac{1}{4}$	16	1	4	72	18	6	17	17	3

[13]		[14]		[15]			[16]		
$	*c.*	$	*c.*	$	*c.*	*m.*	$	*c.*	*m.*
74	69	84	73	72	38	4	56	23	5
68	76	98	43	87	64	3	74	87	9
48	69	74	87	69	47	8	69	64	7
49	94	67	83	68	83	4	78	87	9

[1.] A Mercer's Bill.
Bought of George Bailey, May, 1811.

		s.	d.		l.	s.	d.
9 Yards of Silk	at	14	6	per Yd.	6	10	6
12 Yards of flowered Silk	at	16	8	...	10	0	0
16 Yards of Sarsenet	at	6	9	...	5	8	0
10 Yards of Sattin	at	9	6	...	4	15	0
15 Yards of Brocade	at	10	8	...	8	0	0
11 Scarves	at	2	0	each	1	2	0
14 Yards of Genoa Velvet	at	17	4	per Yd.	12	2	8
10 Yards of Lustring	at	5	2	...	2	11	8
				Sum			

[2.] A Woolen Draper's Bill.
Bought of Thomas Simmons, June 19, 1811.

		s.	d.		l.	s.	d.
16 Yards of Drugget	at	7	0	per Yd.	5	12	0
12 Yards of Broad-Cloth	at	15	0	...	9	0	0
9 Yards of Black Cloth	at	16	5	...	7	7	9
10 Yards of Shalloon	at	1	8	...	0	16	8
15 Yards of Serge	at	1	10	...	1	7	6
7 Yards of fine Spanish Black	at	18	0	...	6	6	0
16 Yards of Frize	at	4	6	...	3	12	0
12 Yards of Superfine Scarlet	at	18	0	...	10	16	0
				Sum			

[3.] A Linen Draper's Bill.
Bought of John Clay, July 17, 1811.

		s.	d.		l.	s.	d.
26 Ells of Dowlas	at	1	4	per Ell	1	14	8
18 Ells of Holland	at	4	0	...	3	12	0
12 Ells of Diaper	at	1	0	...	0	12	0
12 Damask Napkins	at	2	0	each	1	4	0
20 Yards of Printed Linen	at	2	0	per Yd.	2	0	0
10 Yards of Cambric	at	12	0	...	6	0	0
10 Yards of Muslin	at	7	0	...	3	10	0
14 Yards of Canvas	at	3	4	...	2	6	8
				Sum			

[4.] A Grocer's Bill.

Bought of Thomas Hartley, May 19, 1811.

		s.	d.		l.	s.	d.
of Raisins of the Sun	at	0	5	per lb.	0	3	4
of Malaga Raisins -	at	0	4½	——	0	5	7½
of Currants -	at	0	6½	——	0	5	5
of Sugar - -	at	0	4½	——	0	4	1½
ɜar Loaves, wt. 15 lb.	at	0	9	——	0	11	3
of Rice - -	at	0	3	——	0	3	3
Black Pepper -	at	1	6	——	0	7	6
of Cloves - -	at	0	10	per oz.	0	8	4
				Sum			

[5.] A Cheesemonger's Bill.

Bought of Daniel Bridge, July 17, 1811.

		s.	d.		l.	s.	d.
ucester Cheeses, wt. 24lb.	at	0	4	per lb.	0	8	0
rwickshire - wt. 20lb.	at	0	3	——	0	5	0
shire - wt. 28lb.	at	0	4	——	0	9	4
kin of Butter wt. 28lb.	at	0	6	——	0	14	0
ch of Bacon wt. 6 st.	at	4	0	per st.	1	4	0
of Cambridge Butter	at	0	6	——	0	3	6
of new Cheese -	at	0	4	——	0	3	0
of Cream Cheese -	at	0	6	——	0	3	6
				Sum			

[6.] A Milliner's Bill.

Bought of John Inman, August 28, 1811.

		s.	d.		l.	s.	d.
ards of Silver Riband	at	2	3	per Yard.	1	13	9
ir of fine Kid Gloves	at	2	0	per Pair.	0	6	0
oz. of Irish Lamb, do.	at	1	0	——	3	12	0
rsenet Hoods -	at	4	6	each.	1	7	0
ns, Indian Mounts	at	4	0	——	3	0	0
ts of Knots -	at	2	0	per set.	0	6	0
ards of fine Lace	at	10	0	per Yard.	8	0	0
eces of Bobbin -	at	0	6	per Piece.	0	10	0
				Sum			

[7.] A Carpenter's Bill.

Mr. John Law, Dr. to John Brooks, for Carpenter's Work Materials, viz.

1811		s.	d.		l.	s
May 3.	For 30 Feet of Fir Timber at	0	3	per Foot	0	7
5.	— 18 whole Deals at	1	6	each	1	7
	— 16 slit Deals - at	1	0	——	0	16
	— 4 Hundred of six-penny Nails				0	2
	— 3 Hundred of ten-penny Nails				0	2
	— 6 Hundred of Brads -				0	1
	— 18 Days Work at	3	0	per Day	2	14
				Sum		

[8.] A Baker's Bill.

Mr. Thomas Marriot, Dr. to James Barnet, viz.

1811		l.	s.
Feb. 4.	For a Peck of Bran - -	0	0
	— a Fine Peck Loaf - -	0	1
13.	— a Peck of Fine Flour -	0	1
17.	— a Bushel of Pollard - -	0	1
18.	--- small Bread - -	0	0
	--- Yeast - - -	0	0
	--- a half Peck Second Loaf -	0	0
20.	--- a quartern Second Loaf -	0	9
		Sum	

[9.] A Bill of Disbursement.

1811		l.	s
Feb. 17	Laid out in Lamb, seven groats -		
18.	in Sallad, five farthings -		
21.	in Beef, 19 pence half-penny		
Mar. 7.	in Parsnips, three half-pence		
8.	in Potatoes, a groat -		
9.	in Candles, seven groats and three pence		
10.	in Butter and Cheese, eight and twenty pence		
20.	in Bread, three and twenty pence - - - - - - -		
		Sum	

[10.] Suppose I am indebted

	l.	*s.*	*d.*
To A, Twenty pounds, seven shillings and four pence farthing - - -			
B, Nineteen pounds, thirteen shillings and ten pence half-penny - -			
C, Twelve pounds, fourteen shillings and seven pence three farthings -			
D, Twenty-six pounds, seventeen shillings and four pence farthing -			
E, Twenty-eight pounds, thirteen shillings and seven pence three farthings			
F, Twenty-one pounds, fifteen shillings and five pence half-penny -			
G, Five pounds, six shillings and seven pence farthing - - - -			
How much is the debt? Sum			

[11.] A Bookseller's Bill.

Bought of D. D. Smith, August 3, 1814.

		c.		$	*c.*
2	Juvenile Expositors - -	at 75		9	0
4	Do. Spelling Books - -	18¾		4	50
8	Do. Mentors - - -	31¼		5	62½
6	Hutton's Arithmetic - -	62½		3	75
6	Dilworth's Do. - -	41½		2	49
6	Do. Key - - -	100		6	0
				$	

2. OF TROY WEIGHT.

Q. Which are the denominations of Troy Weight?

A. 24 grains, or gr. make 1 Penny-weight, dwt.
20 Penny-weights 1 Ounce, oz.
12 Ounces - - 1 Pound, lb.

Q. What sort of things are weighed by this weight?

A. Gold, silver, jewels, electuaries and all liquors.

Q. What is the standard for gold?

A. 22 carrats of fine gold, and two carrats of copper being melted together, are esteemed the true standard for gold coin.

Q. What is a carrat?

A. A carrat is not any certain quantity of weight, but the twenty-fourth part of any quantity or weight.

Q. *What is the standard* for silver?

A. 11 oz. 2 dwts. of fine silver, and 18 dwts. of co being melted together, are esteemed the true standard silver coin ; called silver sterling.

Note. The ounce of silver being valued at 5 shillings, penny-weight will be valued at 3 pence, and the grain at h farthing.

EXAMPLES.

[1]	[2]	[3]	[4]
Oz.dw.gr.	*Oz.dw.gr.*	*lb.Oz.dw.gr.*	*lb.Oz.dw*
7 10 12	7 13 12	4 10 12 11	7 10 1
6 11 12	6 11 14	3 11 16 12	3 4 1
5 16 11	9 12 17	1 4 16 19	3 7 1
4 17 10	4 16 13	3 3 11 17	1 1 1
1 12 16	7 11 14	4 1 16 14	4 11 1
7 12 18	6 19 12	3 3 16 11	4 3 1
9 16 19	7 13 16	7 11 16 10	3 3 1
8 14 16	3 19 14	6 4 13 15	8 7 1
4 16 10	5 9 8	5 11 14 13	9 8 1
9 4 8	6 12 13	9 10 15 14	9 11 1

3. OF AVOIRDUPOIS WEIGHT.

Q. Which are the denominations of Avoirdupois Wei

A. 16 Drams, or dr. make 1 Ounce, oz.
16 Ounces——————1 pound, lb,
28 Pounds——————1 quarter of an Hund. Wt
4 Quarters——————1 Hund. Wt. or 112 Pound
20 Hundred Wt.———1 Ton, T.

Q. What is the use of Avoirdupois Weight ?

A. Avoirdupois Weight is used in weighing any thing coarse and drossy nature, as all grocery and chandlers' w and all metals, but silver and gold.

Note. Bread formerly was weighed by Troy Weight, l now at London weighed by this weight.

Q. What is the difference between a pound Avoird and a pound Troy ?

A. The pound Avoirdupois is equal to 14 oz. 11 dwt gr. and an half Troy ; and the pound Troy is equal to 1 2 dr. and an half, and $\frac{2323}{15000}$ Avoirdupois.

Q. What other denominations are there in this weigh

A. *There* are several other denominations in Avoird *Weight, in some* particular goods, and others only custo *in some particular* places ; as appears by the following

TABLE.

	lb.		lb.
A firkin of Butter is	56	A burden of Gad Steel, or 9 score is	180
— of Soap is	64	A quintal of Fish in Newfoundland is	100
A barrel of Pot Ash is	200	A stone of Glass is	5
— Anchovies is	30	A seam of Glass 24 stone or	120
— Candles is	120	*For Cheese and Butter.*	
— Figs from to 2 C. 3 qrs.	98	A clove or half stone is	8
— Soap is	256	A wey in Suffolk is 32 clove, or	256
— Butter is	224	—Essex is 42 cloves, or	336
— Gunpowder is	112	*For Wool.*	
— Raisins is	112	A clove is	7
double barrel of Anchovies is	60	A stone is	14
puncheon of Prunes is C. or 12 C.	10	A tod is	28
fother of lead is 19 C. 2 qrs.		A wey is 6 tod and 1 stone, or	182
stone of Iron or Shot is	14	A sack is 2 weys, or	364
———Butcher's Meat is	8	A last is 12 sacks, or	4368
gallon of Train Oil is	7½		
faggot of Steel is	120		

EXAMPLES.

[1]			[2]			[3]			[4]		
C.	qr.	lb.	C.	qr.	lb.	lb.	oz.	dr.	lb.	oz.	dr.
11	1	16	17	1	12	14	10	12	12	11	10
12	3	11	16	2	11	16	12	11	17	12	10
4	1	17	14	1	12	19	12	12	14	12	13
1	2	12	16	3	19	17	12	13	16	12	11
11	1	11	19	1	12	11	10	10	19	12	11
3	2	13	16	3	18	16	15	14	17	13	4
1	2	20	12	1	18	13	11	14	16	11	8
1	3	26	16	3	19	17	12	10	21	10	7

OF APOTHECARIES WEIGHT.

Q. Which are the denominations of Apothecaries Weight?

A. 20 Grains, or gr. make 1 Scruple, ℈.
3 Scruples —— 1 Dram, ʒ.
8 Drams —— 1 Ounce, ℥.
12 Ounces —— 1 Pound, ℔.

Q. What is the use of Apothecaries Weight?

A. Apothecaries Weight is such as their Medicine compounded by.

Note 1. The Apothecaries mix their Medicines by this yet buy and sell their commodities by Avoirdupois Weigh

2. The Apothecaries Pound and Ounce, and the Poun Ounce Troy, are the same, only differently divided and s vided.

EXAMPLES.

[1]					[2]					[3]			
lb	ʒ	ʒ	℈	gr.	lb	ʒ	ʒ	℈	gr.	lb	ʒ	ʒ	
3	11	7	2	19	7	1	3	1	10	7	3	1	
1	3	4	1	13	0	1	1	1	14	6	2	7	
0	1	7	2	12	7	3	4	1	12	3	7	2	
1	2	6	2	11	6	1	1	2	11	1	3	1	
2	1	3	1	12	0	0	3	2	17	2	1	2	
1	2	4	0	11	0	1	0	0	10	1	2	1	
7	10	3	1	16	0	1	2	0	10	4	3	1	
1	7	6	1	15	0	3	7	2	10	7	3	2	

5. OF LONG MEASURE.

Q. What are the denominations of Long Measure?

A. 3 Barley-corns, or b. c. make 1 Inch, In.

4 Inches	———	1 Hand, Hd.
12 Inches	———	1 Foot, Ft.
3 Feet	———	1 Yard, Yd.
6 Feet	———	1 Fathom, Fa.
5 Yards and a half	———	1 Rod, Pole, or Perch
40 Poles	———	1 Furlong, Fu.
8 Furlongs	———	1 Mile, M.
3 Miles	———	1 League, L.
60 Miles	———	1 Degree, Deg.

Note. A Degree is 69 Miles and 4 Furlongs, very though commonly reckoned but 60 Miles.

Q. What is the use of Long Measure?

A. To measure distances of places, or any thing where length is considered, without regard to the brea

Q. Is the Pole or Perch always of the same length?

A. No.

Q. What is the difference?

A. Five Yards and a half are the statute measure f Pole or Perch; but for Fens and Woodlands it is custo *to* reckon 18 feet to the Pole: and for Forests 21 feet.

Q. What is the use of an Hand?

A. It is used to measure Horses.

Q. What is the use of a Fathom?
A. It is used to measure Depths.

EXAMPLES.

[1]		[2]			[3]				[4]			
f.	*p.*	*Yds.*	*f.*	*in.*	*Le.*	*m.*	*f.*	*p.*	*Yds.*	*f.*	*in.*	*b.c.*
7	19	14	2	7	17	2	6	14	16	1	0	0
1	14	16	0	4	12	1	2	18	14	2	10	1
3	16	19	1	10	16	2	1	16	17	1	4	2
4	19	16	2	4	19	2	7	11	13	2	11	1
1	11	14	2	5	19	0	4	31	16	1	7	2
3	16	14	2	1	17	1	1	12	17	1	4	1
7	14	11	1	3	12	1	2	17	19	2	6	2
1	2	11	0	1	17	1	1	14	19	2	1	2

6. OF CLOTH MEASURE.

Q. Which are the denominations of Cloth Measure?
A. 2 Inches, or in. and a quarter make 1 Nail, N.

4 Nails	——	1 Qr. of a Yd. qr.
4 Quarters	——	1 Yard, yd.
3 Quarters of a Yard	——	1 Flemish Ell, E.F.
5 Quarters of a Yard	——	1 English Ell, E.

Note 1. The yard is used in measuring all sorts of woollen thes, wrought silks, most linens, tape and gartering.
2. The Ell English is used only in measuring some particular ens, called Hollands.
3. The Ell Flemish is used in measuring Tapestry.

EXAMPLES.

[1]		[2]			[3]			[4]		
s.	*qrs.*	*na.*	*Ells,*	*qrs.*	*na.*	*Yds.*	*qrs.*	*na.*	*E.F.*	*qrs.*	*na.*
1	1		14	1	2	17	2	0	17	1	2
3	1		17	3	0	16	3	3	17	1	3
1	2		14	4	0	17	1	2	14	1	2
3	1		16	3	2	19	2	0	16	2	0
1	2		19	1	1	17	3	2	14	0	0
3	3		17	2	3	16	1	3	19	2	1
1	1		16	3	1	19	2	1	17	2	2
2	3		15	1	2	17	1	2	16	1	3

7. OF LAND MEASURE.

Q. Which are the denominations of Land Measure?
A. 9 Square feet, or ft. make 1 Yard, Yd.

30 Yards and a quarter	—	1 Pole, Po.
40 Poles in Length and 1 in breadth,	—	1 Rood, R.
4 Roods	—	1 Acre, A.

Q. What is the use of Land Measure ?

A. It gives the contents of any piece of ground in acres.

EXAMPLES.

[1]			[2]			[3]	
A.	*r.*	*p.*	*A.*	*r.*	*p.*	*A.*	*r.*
17	3	12	17	1	12	26	1
11	2	11	11	2	13	18	2
15	1	21	16	3	27	23	3
16	1	12	19	1	15	26	2
27	2	18	12	3	14	22	2
23	2	28	26	2	20	19	0
29	3	17	27	3	24	33	3
20	3	20	22	2	20	27	2

8. OF LIQUID MEASURE.

Q. How many sorts of Liquid Measure are there ?

A. Two : Wine Measure and Winchester Measure.

Q. What is meant by Winchester Measure ?

A. It is a particular measure used for beer and ale.

Q. What is the difference between Wine Measure and Winchester Measure ?

A. A Gallon of Wine is 231 solid inches ; but a gallon Beer or Ale exceeds that measure by 51 inches, and is 2 solid inches.

(1.) *Of Wine Measure.*

Q. Which are the denominations of Wine Measure ?

A. 2	Pints, or pts.	make	1 Quart, qt.
4	Quarts	—	1 Gallon, gal.
10	Gallons	—	1 Anchor of brandy or rum,
18	Gallons	—	1 Runlet, R.
31½	Gallons	—	1 Barrel, Bar.
42	Gallons	—	1 Tierce, T.
63	Gallons	—	1 Hogshead, Hhd.
84	Gallons	—	1 Puncheon, Pun.
2	Hogsheads	—	1 Pipe or Butt, P.
2	Pipes or 4 Hhds.		1 Ton, T.

Q. What other Liquors are measured by the Wine Standard ?

A. All brandies, spirits, strong waters, perry, cider, me *vinegar, honey* and oil.

Note. Milk is also retailed by this standard, not by law, *custom only.*

EXAMPLES.

[1] T.	hhds.	gal.	qts.	[2] Hhds.	gal.	qts.	[3] Tier.	gal.	qts.
7	1	12	2	27	10	2	27	12	1
6	3	31	2	23	13	3	29	17	3
7	1	41	2	26	28	3	21	11	2
8	2	17	2	29	12	2	27	31	3
7	3	14	3	23	22	0	29	12	1
1	2	19	1	27	32	2	27	11	2
9	1	14	2	29	27	3	26	17	1
3	1	15	2	26	33	2	22	11	3

(2.) *Of Winchester Measure.*

Q. Which are the denominations of Winchester Measure?

A. 2 Pints, or pts. make 1 Quart, qt.
4 Quarts — 1 Gallon, gal.
8 Gallons — 1 Firkin of Ale, Fir.
9 Gallons — 1 Firkin of Beer, Fir.
2 Firkins — 1 Kilderkin, Kil.
4 Firkins — 1 Barrel, Bar.
1 Barrel & a half, or 54 Gal. 1 Hogshead of Beer, hhd.

Q. What is the difference between Ale and Beer measure?

A. In London only they compute 8 gallons to the firkin of ale, and 32 gallons to the barrel; but in all other parts of England, for ale, strong beer, and small beer, 34 gallons are computed to the barrel, and 8 gallons and a half to the firkin.

Q. What other commodities are there, that go by the Winchester Measure?

A. A Barrel of Salmon or Eels is 42 Gallons.
A Barrel of Herrings — 32 Gallons.
A Keg of Sturgeon — 4 or 5 Gallons.
A Firkin of Soap — 8 Gallons.

EXAMPLES.

[1] Hhds.	gal.	qts.	[2] B.B	fir.	gal.	[3] Hhds.	gal.	qts.	[4] A.B.	fir.	gal.
7	12	1	23	3	3	26	17	1	23	1	7
6	27	2	27	2	6	12	19	2	24	2	6
3	21	2	29	3	7	21	16	3	27	1	5
2	11	1	27	2	8	31	18	2	27	3	4
3	17	2	26	1	5	27	10	1	26	3	2
2	12	1	27	1	4	31	18	2	27	1	3
6	17	3	27	1	3	26	31	1	26	2	1
7	*31*	*2*	*32*	*2*	*2*	31	26	2	29	1	0

9. OF DRY MEASURE.

Q. Which are the usual denominations of Dry Measure

A.

2 Pints, or pts.	make	1 Quart, qt.
2 Quarts	—	1 Pottle, pot.
2 Pottles	—	1 Gallon, gal.
2 Gallons	—	1 Peck, P.
4 Pecks	—	1 Bushel, Bush.
8 Bushels	—	1 Quarter of Corn, qr.
36 Bushels	—	1 Chaldron of Coal, Ch.

Q. Wherein does London differ from other places in England in the Coal Measure?

A. In London 36 bushels make a chaldron; but in all other places 32 bushels make a chaldron. The bushel also in water measure contains 5 pecks.

Q. What other denominations are there in Dry Measure

A.

A Score of Coals	is	21 Chaldrons.
A Sack of Coals	—	3 Bushels.
A Sack of Corn	—	4 Bushels.
10 Quarters of Corn	make	1 Wey.
12 Weys	—	1 Last.
A Load of Corn	—	5 Bushels.
A Cart-load ditto	—	40 Bushels.

Q. What is the use of Dry Measure?

A. Dry Measure is applied to all dry-goods, as corn, seeds, fruits, roots, sand, salt, sea-coal, charcoal, small coal, oysters, muscles, and cockles.

Q. What is the standard for Dry Measure?

A. The standard for Dry Measure is a Winchester bushel being 18 inches and a half wide throughout, and 8 inches deep. One gallon of this quantity is 280 solid inches and $\frac{1}{2}$, and consequently is less than an Ale gallon by 13 solid inches and $\frac{1}{2}$.

EXAMPLES.

[1]			[2]			[3]			[4]		
Ch.	*bu.*	*p.*	*Qrs.*	*bu.*	*p.*	*Ch.*	*bu.*	*p.*	*Qrs.*	*bu.*	*p.*
17	11	3	14	7	2	27	10	1	36	7	
16	10	2	16	1	1	17	12	2	43	6	
19	11	1	19	3	2	14	21	1	22	3	
17	12	3	16	1	1	31	32	2	37	3	
16	19	3	17	3	2	71	19	1	26	5	
17	11	1	16	1	1	16	12	2	28	4	
17	11	3	12	3	1	17	31	3	33	7	
11	*14*	*1*	*37*	*2*	*3*	16	14	1	42	3	

10. OF TIME.

Which are the denominations of Time?

60 Seconds, or Sec. make 1 Minute, Min.
60 Minutes — 1 Hour, Hr.
24 Hours — 1 Day, Da.
7 Days — 1 Week, Wk.
4 Weeks — 1 Month, Mo.

Months, 1 day & 6 hours 1 common or Julian Year, Yr.

What is a Solar Year?

According to the best computation, a Solar Year is 365 5 hours, 48 minutes, and 55 seconds.

How is the year divided by the calendar?

No more days than 30 hath th' month of September,
same may be said of June, April, November,
rest of the months have just 30 and one,
ept that short month February alone,
ch to itself claimeth just 8 and a score,
in every leap year we give it one more.

EXAMPLES.

	[2]	[3]	[4]
	H. m. sec.	*M. w. d.*	*D. h. m. sec.*
	17 10 32	31 2 1	17 11 13 16
	17 22 21	17 1 6	19 12 16 11
	14 21 32	17 2 4	17 12 17 13
	4 2 3	16 1 1	14 13 26 31
	7 3 1	17 2 1	13 12 11 48
	73 16 30	16 2 5	17 19 19 12
	22 28 42	19 1 4	13 23 26 51

11. OF MOTION.

Which are the denominations of Motion in the heavens?

60 Seconds, or″ make 1 prime Minute,′.
60 Minutes — 1 Degree,°.
30 Degrees — 1 Sign.
12 Signs, or 360 Degrees, make the whole great *Circle of the* Zodiac.

EXAMPLES.

[1]			[2]			[3]		
°	′	″	°	′	″	°	′	″
71	10	16	47	17	19	46	17	31
12	11	19	17	10	38	17	36	18
17	16	13	12	11	41	13	11	12
19	11	26	13	10	16	16	19	12
17	48	51	26	17	12	17	12	10
14	12	11	73	19	12	16	12	10
17	16	11	16	41	32	11	19	17
57	16	17	21	32	41	31	26	46

12. OF THINGS BOUGHT AND SOLD BY THE TALE.

Q. Which are the denominations of things accounted by the Tale?

A. 12 Particulars make 1 Dozen.
12 Dozen — 1 Gross.
12 Gross or 144 Dozen 1 great Gross.

Examples are needless.

QUESTIONS TO EXERCISE ADDITION.

1. A man was born in the year 1702, I demand when he will be 57 years of age?

2. There are 2 numbers whose difference is 17, and the lesser number is 44; what is the greater number?

3. A man borrowed a sum of money, and paid in part 12*l.* 10*s.* and the remainder is 17*l.* 10*s.* I demand the sum borrowed?

4. A owes me three guineas, B 50*l.* 12*s.* C 104*l.* D three score and seventeen pounds. How much is due to me in all?

5. A B and C bought a parcel of Goods, in the purchase of which A laid out 3*l.* B 40*s.* and C 20*d.* How much was laid out in all?

6. A man has 6 bags of Hops; the first weighs 2 qrs. 14lb. and each of the rest weighs 14lb. more. What quantity hath he in the whole?

7. A man took a house for 12 years; and by agreement was to pay 100*l.* 10*s.* down: 190*l.* 4*s.* at the end of 6 years, and 109*l.* 6*s.* at the end of 12 years. I demand the whole sum?

8. A shop-keeper having opened a shop, the first week *sold goods to the* value of three score pounds; the next week *he took fourscore* pounds, but the third week he took no more *than thirty shillings*. How much did he receive in all?

OF SUBTRACTION.

Q. WHAT is the use of Subtraction ?

A. By taking a less number from a greater, it shows the ſference between both.

Q. How many sorts of Subtraction are there ?

A. Two : Simple and Compound.

OF SIMPLE SUBTRACTION.

Q. What is Simple Subtraction ?

A. Simple or Single Subtraction is the finding a difference :tween any two numbers, whose signification is the same ; the difference between 6 yards and 4 yards, is 2 yards.

Q. How are numbers to be placed in Subtraction ?

A. With units under units, tens under tens, &c. as in Ad-ıtion.

Q. What rule have you for the operation of Subtraction ı general ?

A. When the lower number is greater than the upper, ıke the lower number from the number which you borrow, ıd to that difference add the upper number, carrying one) the next lower place.

Q. What number must you borrow when the lower num-er is greater ?

A. The same which you stop at in Addition.

Q. How do you prove Subtraction ?

A. By adding the remainder and the lesser line together, hich will always be equal to the greater line. Or by sub-racting the remainder from the greater line, and that differ-nce will always be equal to the lesser line.

EXAMPLES.

	L.	*Yards.*	*Miles.*	*Days.*	*Months.*
rom	763	7694	41372	761214	7613471
'ake	122	1867	13976	121812	2813126
iffer.					
	Hours.		*lb.*	*Crowns.*	*Shillings.*
'rom	31261812		312617127	71161871	7612641
'ake	19879428		173121712	26571014	5910917
iffer.					

OF COMPOUND SUBTRACTION.

Q. What is Compound Subtraction.

A. *Compound Subtraction* produces a difference between *o sums of divers* denominations.

1. OF MONEY.

EXAMPLES.

	[1]			[2]			[3]			[4]		
	l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
From	14	10	6½	36	12	6½	76	12	6¾	31	18	4½
Take	3	17	8½	17	12	2¼	27	13	3¼	16	19	1
Differ.												

	[5]			[6]			[7]			[8]		
	l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
Borr.	41	15	3	76	3	4½	73	7	7	17	12	1½
aid	10	17	1½	13	17	7	19	4	1½	14	7	2
Unpaid												

	[9]			[10]			[11]			[12]		
	l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
Lent	137	11	6¼	47	16	6	413	11	7¾	71	18	9
Recd.	76	12	7¾	29	11	6½	171	18	9½	17	16	10¾
Due												

	l.	*s.*	*d.*		*l.*	*s.*	*d.*
Borrowed	764	0	0	Lent	800	10	6
Paid at several times.	13	1	1½	Received at several times.	12	11	2¼
	17	4	2		19	12	6½
	16	1	6¾		17	11	2
	21	2	1		14	11	3
	19	11	10		19	12	2
	26	13	5¼		14	11	8¾
	11	19	6½		17	16	2¼
	13	12	2¼		46	12	7¼
Paid in all				Received in all			
Unpaid				Remains due			

$	*c.*	*m.*	$	*c.*	*m.*	$	*c.*
78	43	9	87	63	2	528	75
47	87	2	27	87	6	283	87

2. OF TROY WEIGHT.

	Oz.dw.gr.	*oz. dw.gr.*	*oz. dw.gr.*	*lb. oz. dw.gr.*
From	71 11 12	71 12 18	13 16 12	84 4 11 12
Take	2 10 19	10 4 19	5 19 14	17 10 11 17
Differ.				

3. OF AVOIRDUPOIS WEIGHT.

	C. qr. lb.	*lb. oz. dr.*	*lb. oz. dr.*	*T. C. qr. lb.*
Bought	72 1 18	17 2 1	17 10 1	12 1 2 10
Sold	3 1 26	10 13 2	15 14 3	5 3 1 19
Unsold				

4. OF APOTHECARIES WEIGHT.

	℥ ʒ ʒ ℈ *gr.*	℥ ʒ ʒ ℈ *gr.*	℔ ℥ ʒ ℈ *gr.*
From	65 4 2 10	47 5 1 16	48 2 2 0 19
Take	7 7 2 12	2 1 2 18	10 1 2 2 17
Differ.			

5. OF LONG MEASURE.

	Le. m. f. p.	*Yds. f. in. b.c.*	*Le. m. f. p*
From	71 1 3 10	48 0 3 2	61 0 1
Take	14 2 5 16	14 0 1 1	19 1 2 2(
Differ			

6. OF CLOTH MEASURE.

	Yd. qr. n.	*E. F. qr. na.*
Bought	71 3 1	51 2 2
Sold	14 2 3	16 1 2
Unsold		

	Yd. qr. n.	*EE. qr. n.*
From	47 2 1	17 2 2
Take	12 1 3	14 4 3
Differ.		

A Draper bought 148 0 (

Sold at several times.

Yd. qr. na
14 1
17 3
19 1
15 2
17 3

Sold in all

Unsold

7. OF LAND MEASURE.

	A. r. p.	*A. r. p.*	*A. r. p.*	*A. r. p*
Bought	12 1 10	17 3 17	28 1 7	32 0
Tilled	5 3 17	12 3 23	19 1 28	16 2 2
Untilled				

8. OF WINE MEASURE.

	T. hds. gal.	*T. hds. gal.*	*Gal. qts. pts.*	*Gal. qts. pts*
From	3 2 10	7 2 10	19 2 1	67 1 1
Take	1 3 19	1 2 28	12 1 1	12 3 0
Differ				

9. OF WINCHESTER MEASURE.

	Hhds.gal.qts.	*A.B.fir.gal.*	*B.B.fir.gal.*	*Hds.g*
Bought	17 10 1	17 2 1	48 1 3	41
Sold	12 11 2	14 1 3	17 1 7	23

10. OF DRY MEASURE.

	Ch.bu.p.	*Ch.bu.p.*	*qrs.bu.p.*	*qrs.*
From	17 2 1	40 1 2	19 1 1	26
Take	10 1 3	16 5 1	12 7 2	19

11. OF TIME.

	D. h. m. sec.	*W. d. h. m. sec.*	*W. d. h. m.*
From	41 13 22 12	14 1 10 12 10	17 1 10 1
Take	22 16 33 31	10 3 19 48 26	10 2 14

12. OF MOTION.

	° ′ ″	° ′ ″	° ′
From	48 10 12	47 2 10	62 1
Take	19 11 13	12 19 46	49 1

QUESTIONS TO EXERCISE SUBTRACTION.

1. A man was born in the year 1702 : I demand his in the year 1781 ?

2. There are two numbers, the greater number is 61 the lesser number is 44 ; I demand the difference ?

3. There are two numbers, whose difference is 17, the greater number is 61, I demand the lesser sum ?

4. The Brewer and the Baker drew bills each upon other ; the Brewer stands indebted 45*l.* 19*s.* and the B 36*l.* and 7*d* ½, who is the proper person indebted, and much ?

5. A man borrowed 30*l.* and paid in part 12*l.* 10*s.* I mand how much remains unpaid ?

6. King Charles the Martyr was beheaded in the 1648 ; How many years is it since ?

7. *A is indebted* to the Brewer the sum of 109*l.* 1(*owes him* 94*l.* 4*s.* 10*d* ½, *how much does one owe than the other ?*

8. What sum is that, which taken from 100*l.* leaves 48*l.* 7*s.* 6*d.* $\frac{1}{2}$?

9. There were 4 bags of money, containing as follows: viz. the first bag 34*l.* the second bag 50*l.* the third bag 100*l.* and the fourth bag 150*l.* which were to be paid to several persons; but one of the bags being lost, there were but 234*l.* paid; I demand which bag was wanting?

OF MULTIPLICATION.

Q. What is Multiplication?

A. It is the short way of performing several additions.

Q. How many parts are there in Multiplication?

A. Three, viz.

1. The Multiplicand, or sum to be multiplied.
2. The Multiplier, or the sum multiplied by.
3. The Product, or total of the multiplicand, as often as there are units in the multiplier.

Note. The Multiplicand and the Multiplier, are also called Factors, and the Product, the Fact or Rectangle.

Q. How many sorts of Multiplication are there?

A. Two, viz. Simple and Compound.

OF SIMPLE MULTIPLICATION.

Q What is Simple Multiplication?

A. Simple Multiplication is the multiplying of any two numbers together, without respect to their signification; as 7 times 8 is 56.

Note 1. As addition and subtraction of Integers are called Simple Addition and Simple Subtraction; so should multiplication and division of Integers be called Simple Multiplication and Simple Division—and that only should be called Compound multiplication and Compound Division, which hath numbers of divers denominations to be either multiplied or divided.

2. The following table must be learned perfectly by heart, before you can proceed any further

THE MULTIPLICATION TABLE.

3 times	3 is 9	5 times	6 is 30	11 times	3 is
	4 12		7 35		4
	5 15		8 40		5
	6 18		9 45		6
	7 21	6 times	6 36		7
	8 24		7 42		8
	9 27		8 48		9
4 times	4 16		9 54	12 times	3
	5 20	7 times	7 49		4
	6 24		8 56		5
	7 28		9 63		6
	8 32	8 times	8 64		7
	9 36		9 72		8
5 times	5 25	9 times	9 81		9 1

Case 1.

Q. What do you observe in the first case of Multiplicatio

A. That the factors be placed one under another, in su manner, that units may stand under units, tens under ten &c. and then multiply as the table directs.

EXAMPLES.

l.	*Crowns.*	*Days.*	*Hours.*
47613127	47613174	71261812	7126131
2	3	4	
Minutes.	*Years.*	*Gallons.*	*Ounces*
73126184	71312674	31261267	4761231
6	7	8	
Shillings.	*Yards.*	*Bushels.*	*Ells.*
31361731	76138126	82365243	6542371
11	12	11	

Case 2.

Q. What do you observe in the second case of Multip cation ?

A. 1. When the multiplier consists of more figures th one, there must be made as many several products as the are figures contained in the multiplier.

2. Let the first figure of every product be placed exact *under its multiplier.*

3. Add these products together, and their sum will be the tal product.

Q. How do you prove Multiplication?

A. Multiplication and division do mutually prove each her; yet Multiplication may as truly be proved by itself, by verting the factors.

EXAMPLES.

Crowns.	*Days.*	*Weeks.*	*Pence.*
691861	129186	281216	181261
26	98	978	763
988386	12660228	275029248	138317463

Ounces.	*Yards.*	*Pints.*	*Quarts.*
269181	261986	812617	281691
4629	7638	43859	76286
46038849	2001049068	35640569003	21489079626

Q. What exceptions have you to this case?

A. 1. When these figures, 1 and 1, or 1 and 2, happen to- her in the multiplier, you may multiply by both at once, in Case 1.

EXAMPLES.

Weeks.	*Bushels.*	*Grains.*	*Leagues.*
761312	671612	963458	843126
412	114	912	119
3660544	76563768	878673696	100331994

1. When any other number between 12 and 20 happens, 13, 14, 15, &c. then multiply by the figures in units place, as you multiply, add to the product of each single figure, t of the multiplicand, which stands next on the right hand.

EXAMPLES.

lons.	*Days.*	*Months.*	*lb.*
1317	4713176	4631261	4713761
15	16	17	18

Case 3.

Q. What do you obseve in the third case of Multiplica- ?

A. 1. Such factors as have cyphers at the ends, must be *one under another, as if* there were no cyphers.

2. The cyphers placed at the end of either, or both of the factors, are to be omitted till the last product, and then the same number of cyphers must be annexed to it.

EXAMPLES.

Pence.	*Hours.*	*Years.*
476000	180120	461210
170	48100	8190(
80920000	8663772000	3777309900(
Nails.	*Inches.*	*Barrels*
760000	461200	618010
4800	72000	74210
3648000000	33206400000	4586252210(

Case 4.

Q. What do you observe in the fourth case of Multiplication ?

A. When cyphers are placed between the significant figures in the multiplier, they must be omitted in the operation : regard being had to the first figure of every particular product as before.

EXAMPLES.

128121	128128	246145
72001	70043	60012
9224840121	8974469504	14771653740

Case 5.

Q. How do you multiply by the parts of any number instead of the whole ?

A. When the multiplier is such a number, that any two figures being multiplied together will make the said multiplier, it is shorter to multiply the given number by one of those figures, and that product by the other, as 5 times 7 is 35.

EXAMPLES.

764126	764131	461231	46131
35	48	72	3
26744410	36678288	33208632	1660723

OF COMPOUND MULTIPLICATION.

Q. What is Compound Multiplication?

A. When several numbers of divers denominations are given to be multiplied by one common multiplier, this is called Compound Multiplication.

EXAMPLES.

s.	*d.*	*lb.*	*oz.*	*dwt.*	*gr.*	*C.*	*qrs.*	*lb.*	*lb.*	*oz.*	*dr.*
7	3	17	5	12	16	43	1	14	17	12	10
	2				3			4			5

l.	*f.*	*p.*	*Yds.*	*f.*	*in.*	*b.c.*	*Yds.*	*qrs.*	*na.*	*B.B.fir.*	*gal.*
6	4	21	17	2	3	1	16	3	2	17	2 3
		6				7			8		9

h.	*bu.*	*p.*	*M.*	*w.*	*d.*	*D.*	*h.*	*m.*	*sec.*	°	′	″
6	12	3	16	3	4	17	14	14	15	16	11	13
		10			11				12			7

	c.	*m.*	£.	*c.*	*m.*	£.	*c.*	£.	*c.*
)	47	3	83	47	6	74	25	48	36
		6			7		8		5

Note. If the learner be taught to turn back to the bills of parels in Addition, he will find plenty of examples in Compound ultiplication.

QUESTIONS TO EXERCISE MULTIPLICATION.

1. If one man's pay be 3*s.* what must 40 men have?

2. What is the product of 76, multiplied by 3, and by 7?

3. There are 124 men employed to finish a piece of work, d they are to have 3*l.* each man; I demand how much ey must all have?

4. An army of 10,000 men having plundered a city, took much money, that when it was shared among them, each an had 27*l.* I demand how much money was taken in all?

5. There were 40 men concerned in the payment of a sum money, and each man paid 127*l.* how much was paid in l?

6. If one foot contains 12 inches, I demand how many ches there are in 126 feet?

7. What is the product of 769, multiplied by 9 and by 7?

OF DIVISION.

Q. WHAT is Division?

A. It is a short way of performing several subtractions, and shows how often one number is contained in another, and what remains.

Q. How many parts are there in Division?

A. Four, viz.

1. The Dividend, or sum to be divided.
2. The Divisor, or sum divided by.
3. The Quotient, or answer to the question.
4. The remainder, which is always less than the divisor, and of the same name with the dividend.

Note. The Divisor, Dividend and Quotient are certain, but the Remainder is uncertain, because some operations in Division have no remainder.

Q. How many sorts of Division are there?

A. Two; Simple and Compound.

OF SIMPLE DIVISION.

Q. WHAT is Simple Division?

A. Simple Division is, when the divisor and dividend are made choice of, without any regard to their signification; as, 56 divided by 7, gives 8 for the quotient; or, the number 7 is contained in 56 eight times.

Q. How many sorts of Simple Division are there?

A. Two; Short Division and Long Division.

OF SHORT DIVISION.

Q. What is Short Division?

A. Short Division is when the Divisor does not exceed 12.

EXAMPLES.

Minutes.	*Months.*	*Days.*
2)71313674	6)312610841(	11)7312613107(
3)42310812	7)7131267191(	12)3812617314(
4)13812612	8)701267131(	11)1612798131(
5)61231281	9)126713108(	12)1731261712(

Q. How is Division proved?

A. Multiply the Divisor and Quotient together, and the remainder (if any there be) add to the product: that sum will be equal to the dividend.

OF LONG DIVISION.

Case 1.

Q. What is Long Division?

A. When the Divisor is more than 12, for help of the *memory, we are obliged to multiply* the quotient figure and

sor together, and subtract that product from the divi-
d, in order to find out the remainder ; which operation
t be continued to every quotient figure: and this is called
g Division.

EXAMPLES.

Yards.	*Shillings.*	*Pence.*
72265871(	28)71261714(	1217)31917312(
31712617(	19)73126171(	3164)12697126(
17312618(	381)13261714(	6128)71217312(
17312617(	773)31746173(	2912)17161231(
73181061(	937)13189714(	33108)91261814(
76131714(	761)12816171(	71216)17131716(
31231712(	7618)18917312(	86257)34175362(

Case 2.

). What do you observe of cyphers placed at the end of
divisor ?

. They must be cut off, and the same places also must
cut off in the dividend.

. Those figures which are cut off in the dividend, must
nnexed to the remainder at last.

EXAMPLES.

Yards.	*Crowns.*
00)712613|12(	128|000)71116|071(
00)713121|74(	412|000)71613|181(

Case 3.

). How do you divide by the parts of any number, instead
he whole ?

. When the divisor is such a number, that any two fig-
s being multiplied together, will make the said divisor, it
horter to divide the given number by one of those figures,
that quotient by the other ; as, 5 times 7 is 35.

EXAMPLES.

Pence.	*Crowns.*	*Pounds.*
26744410(	48)36678288(	72)33208632(

OF COMPOUND DIVISION.

). What is Compound Division ?

. When several numbers of divers denominations are
n to be divided by one common Divisor : this is called
mpound Division.

s.	*d.*	*lb.*	*oz.*	*dwt.*	*gr.*	*T.*	*C.*	*qr.*	*lb.*
12	$6\frac{1}{2}$(	3)14	10	3	14(	4)17	1	1	15(
oz.	*dr.*	*M.*	*f.*	*p.*		*Yds.*	*f.*	*in.*	*b.c.*
12	*10(*	*6)38*	*2*	*14(*		*7)46*	*0*	*10*	*9(*

Yd.	*qr.*	*na.*	*A.B.fir.*	*gal.*	*C.*	*bu.*
8)16	2	2(	9)17	3 2(	10)20	13
M.	*w.*	*d.*	*D.*	*h. m. sec.*	°	′
11)48	2	2(	12)46	16 12 30(	12)33	4
£.	*c.*	*m.*	£.	*c.* *m.*	£.	*c.*
7)94	87	3(	5)69	47 3(	8)627	43

QUESTIONS TO EXERCISE DIVISION.

1. If 140*s.* be divided amongst 40 men, how much a pei

2. If 1596 be divided by 21, what is the quotient ?

3. There are 124 men, who have 372*l.* among them, l much must each man have ?

4. An army of 19000 men, having plundered a city, t 2660000*l.* how much must each man have ?

5. There was a certain number of men concerned in payment of 1272*l.* and each man paid 3*l.* I demand the n ber of men ?

6. What is the quotient of 48447 divided by 9 and 7 b

7. If 3264 be divided by 12 and by 4, what is the quoti

8. A certain man intending to go a journey of about 3 miles, would complete the same in 136 days ; I demand l many miles he must travel each day ?

OF REDUCTION.

Q. WHAT is Reduction ?

A. Reduction is the bringing or reducing numbers of denomination into other numbers of another denominat but of the same value.

Q. How are denominations of any kind reduced from to another ?

A. By Multiplication and Division.

Q. When is Multiplication to be used ?

A. When great names are to be brought into small pounds into shillings, or days into hours, and this is c Reduction Descending,

Q. When is Division to be used ?

A. When small names are to be brought into great shillings into pounds, or hours into days, and this is c (though improperly) Reduction Ascending.

Note. Whether you multiply or divide, it must be by a ny of the less, as make one of the greater denominations.

Q. How are questions in Reduction proved?
A. By varying the order of them.

1. OF MONEY.
REDUCTION DESCENDING.

1. In 46*l.* how many shillings and pence, Ans. 920*s.* 11040*d.*

46*l.*
20
920*s.*
12
11040*d.*

2. In 7*l.* how many shillings & pence? Ans. 140*s.* 1680*d.*
3. In 9*l.* how many shillings, pence and farthings? Ans. 180*s.* 2160*d.* 8640*qrs.*
4. In 7*l.* 14*s.* 6*d.* ½ how many farthings? Ans. 7417*qrs.*
5. Reduce 46*l.* 14*s.* 9*d.* ¾ into *qrs.* Facit 44871*qrs.*
6. Reduce 50*l.* 9*s.* 9*d.* ½ into half-pence. Facit 24235 half-pence.
7. Reduce 160*l.* 15*s.* 6*d.* into six-pences. Facit 6431 six-pences.
8. Reduce 48*l.* 12*s.* 8*d.* into groats. Facit 2918 groats.
9. Reduce 90*l.* 17*s.* 6*d.* into two-pences. Facit 10905 two-pences.
10. In 12 crowns how many shillings and pence? Ans. 60*s.* 720*d.*
11. In 15*l.* how many crowns and shillings? Ans. 60 cr. 300*s.*
12. In 50 half-crowns, how many pence and farthings? Ans. 1500*d.* 6000*qrs.*
13. In 306 crowns how many half-crowns and pence? Ans. 612 half-crowns, 18360*d.*
14. Reduce 120 six-pences, into three-pences, pence and farthings. Facit 240 three-pences, 720*d.* 2880*qrs.*
15. Reduce 210 crowns into shillings, groats and pence. Facit 1050*s.* 3150 groats, 12600*d.*
16. Reduce 86 pounds into crowns, shillings and groats. Facit 344 crowns, 1720*s.* 5160 groats.
17. How many shillings and pence are in 17 guineas? Ans. 357*s.* 4284*d.*
18. How many crowns and six-pences are in 28 pounds? Ans. 112 crowns, 1120 six-pences.
19. *How many cents* are in 127 dollars? Ans. 12700 cents.
20. *How many mills* are in $47 83c. 4m.? Ans. 47834m.

REDUCTION ASCENDING.

1. In 11040*d.* how many shillings and pounds ? Ans. 920*s.* 46*l.*

2|0
12)11040(92|0(46

2. In 1680*d.* how many shillings and pounds ? Ans. 140*s.* 7*l.*

3. In 9640*qrs.* how many pence, shillings and pounds ? Ans. 2160*d.* 180. 9*l.*

4. In 7417*qrs.* how many pounds ? Ans. 7*l.* 14*s.*6$d\frac{1}{4}$.

5. Reduce 44871*qrs.* into pounds. Facit 46*l.* 14*s.* 9$d.\frac{1}{4}$.

6. Reduce 24235 half-pence into pounds. Facit 50*l.*9*s.*9$d.\frac{1}{2}$.

7. Reduce 6431 six-pences into pounds. Facit 160*l.* 15*s* 6*d*.

8. Reduce 2918 groats into pounds. Facit 48*l.* 12*s.* 8*d.*

9. Reduce 10905 two-pences into pounds. Facit 90*l.* 17*s.* 6*d.*

10. In 720*d.* how many shillings and crowns ? Ans. 60*s.* 12 crowns.

11. In 300*s.* how many crowns and pounds ? Ans. 60 crowns, 15*l.*

12. In 6000*qrs.* how many pence and half-crowns ? Ans. 1500*d.* 50 half-crowns.

13. In 18360*d.* how many half-crowns and crowns Ans. 612 half-crowns, 306 crowns.

14. Reduce 2880*qrs.* into pence, three-pences, and six-pences. Facit 720*d.* 240 three-pences, 120 six-pences.

15. Reduce 12600*d.* into groats, shillings and crowns. Facit 3150 groats, 1050*s.* 210 crowns.

16. Reduce 5160 groats into shillings, crowns and pounds. Facit 1720*s.* 344 crowns, 86*l.*

17. How many shillings and guineas are in 4284 pence ? Ans. 357*s.* 17 guineas.

18. How many crowns and pounds are in 1120 six-pences ? Ans. 112 cr. 28*l.*

19. Reduce 753000 cents to dollars. Ans. 7530 dollars.

20. Reduce 39428 mills to dollars. Ans $39 42*c.* 8*m.*

REDUCTION ASCENDING AND DESCENDING.

1. In 720 shillings, how many pence and crowns ? Ans. 8640*d.* 144 crowns.

720*s.*
12
6|0)864|0(144 crowns.

2. In 120 shillings, how many crowns and half-crowns Ans. 24 crowns, 48 half-crowns.

3. In 60 crowns, how many shillings and pounds ? Ans *300s. 15l.*

In 612 half-crowns, how many crowns and pence? Ans. crowns, 18360*d.*

. In 40 guineas, how many shillings, crowns and pounds? . 840*s.* 168 crowns, 42*l.*

. Reduce 12600 pence into shillings, groats and crowns. it 1050*s.* 3150 groats, 210 crowns.

. Reduce 63 crowns into shillings and guineas. Facit *s.* 15 guineas.

. Reduce 70 moidores into pounds. Facit 94*l.* 10*s.*

. Reduce 12180 three-pences into shillings, pence and ats. Facit 3045*s.* 36540*d.* 9135 gr.

0. How many crowns, groats and pounds are in 1720*s.*? *s.* 344 cr. 5160 gr. 86*l.*

11. How many groats, three-pences and six-pences are in l shillings? Ans. 363 gr. 484 three-pences, 242 six-pences.

12. How many pounds and crowns are in 1120 six-pences? *s.* 28*l.* 112 cr.

13. How many crowns, half-crowns and shillings are in *l.* and the number of each equal? Ans. 658, and 7*s.* over

14. Four men brought each 17*l.* 10*s.* value in gold into the it to be coined into guineas, how many must they have? *s.* 66 guineas, 14*s.*

15. There are 12 purses with each 12 guineas, how much rling is the sum? Ans. 151*l.* 4*s.*

16. A certain ground tenant was behind with his landlord 16 years rent at 5*l.* 10*s.* a year, how much was the debt? *s.* 88*l.*

17. There are 34*l.* 17*s.* to be divided among 17 men, how ch is it a piece? Ans. 2*l.* 1*s.*

18. In 19 moidores, how many pounds sterling? Ans. . 13*s.*

OF TROY WEIGHT.

1. In 47*lb.* 10*oz.* how many grains? Ans. 275520 *gr.*

2. In 47128 grains of gold how many *lb.*? Ans. 8*lb.* 2*oz.* *wts.* 16*gr.*

3. In 10*lb.* of silver how many spoons, each 5*oz.* 10*dwts.* *s.* 21 spoons, and 90*dwts.* over.

4. In 4560 grains of gold how many tea spoons, each half ounce? Ans. 19 tea spoons.

5. In 47 salvers, each 20*oz.* how many *lb.*? Ans. 78*lb.* 4*oz.*

6. How many porringers, each 11*oz.* are in 19*lb.* 10*oz.* *dwts.* of silver? Ans. 21 porringers, and 15 dwts. over.

7. *A goldsmith having* three ingots of silver, each weigh

ing 27*oz.* was minded to make them into spoons of 2*oz.* cu of 5*oz.* salts of 1 *oz.* and snuff-boxes of 2 *oz.* and to have equal number of each; the question is, what was that numbe Ans. 8 of each sort, and 1*oz.* over.

8. In 17 ingots of silver, each 27*oz.* 10*dwts.* how ma grains? Ans. 224400*gr.*

OF AVOIRDUPOIS WEIGHT.

Q. Which are the allowances usually made in Avoirdup great weight to the buyer?

A. They are tare, trett, and cloff.

Q. What is tare?

A. Tare is an allowance made to the buyer for the weight the box, bag, vessel, or whatever else contains the goo bought; and is either,

1. At so much per bag, barrel, box, &c.
2. At so much per cent, or
3. At so much in the gross weight, called invoice tare.

Q. What is trett?

A. Trett is an allowance made by the merchant to the buy of 4*lb.* in 104*lb.* that is, the six and twentieth part for waste a dust, in some sorts of goods.

Note. If an allowance be made both for tare and trett, in th same parcel of goods, the tare is first to be deducted, and the re mainder is called suttle weight.

Q. What is cloff?

A. Cloff is an allowance of 2*lb.* weight to the citizens of Lon don, on every draft above 3C. weight, on some sorts of goods as galls, madder, sumac, argol, &c.

Q. What are these allowances called beyond the seas?

A. They are called the courtesies of London; because the are not practised in any other place.

Q. What is gross weight?

A. Gross is the weight of any sort of merchandize, and th which contains it being weighed both together.

Q. What is neat weight?

A. Neat is the pure weight of the goods, after all allowanc are deducted.

Note 1. Raw, long, short, China, Morea silk, &c. are weigh by a great pound of 24 ounces. But ferret, filosella, sleev silk, &c. by the common pound of 16 ounces.

2. To bring great pounds into common, multiply by 2, a *divide by 3.*

3. *To bring* common pounds into great, multiply by 3, a *divide by 2.*

Case 1.

EXAMPLES.

1. In 7*C.* 3*qrs.* 10*lb.* how many ounces and drams Ans. 14048*oz.* 224768*dr.*

2. In 3 tons of iron, how many C. qrs. and lb. ? Ans. 60C. 240*qrs.* 6720*lb.*

3. In 14048 oz. how many C.? Ans. 7*C.* 3*qrs.* 10*lb.*

4. In 6720 lb. of iron, how many tons ? Ans. 3*tons.*

5. In 461 great pounds of Morea silk, how many ounces and drams ? Ans. 11064*oz.* 177024*dr.*

6. In 40426 drams of silk, how many great pounds ? Ans. 105 great pounds, 6*oz* 10*dr.*

7. In 3lb. of cinnamon, how many parcels, each 12 ounces ? Ans. 4 parcels.

8. In 470 parcels of sugar, each 26lb. how many C.? Ans. 109C. 0*qrs.* 12*lb.*

9. In 672 great pounds of silk, how many common pounds ? Ans. 1008 common pounds.

10. In 480 common pounds of silk, how many great pounds ? Ans. 320 great pounds.

11. In 8 hogsheads of tobacco, each weighing neat 7C. $\frac{1}{2}$, how many pounds? Ans. 6720*lb.*

12. In 17 pigs of lead, each weighing 4C. $\frac{3}{4}$, how many fother, at 19C. $\frac{1}{2}$? Ans. 4 fother, 2*C.* 3*qrs.*

13. In 712C. of lead, how many fother ? Ans. 36 fother, 10C.

14. In 17C. 1*qr.* 6*lb.* of sugar how many parcels, each 17*lb.* ? Ans. 114 parcels.

Case 2.

OF TARE AND TRETT, &c.

Note. If the teacher approves of it, he may introduce this and the following cases, after Practice instead of this place.

Q. When the tare is at so much per barrel, bag, &c. how is the neat weight found ?

A. Multiply the number of the said barrels, bags, &c. by the tare, and subtract that product from the gross ; the remainder is the neat.

Note 1. The table of allowance for tare in the book of rates, says:

For Cyprus and Smyrna Silk.

Bales { about or above 300*lb.* / *from 300 to 200* / *from 200* downwards } The tare per bale, is { 16 / 14 / 12

For Virginia Tobacco.

Hhds. { 5C. and upwards / from 5 to 4C. / from 4 to 3C. / under 3C. } The tare per hhd. is { 16 / 9 / 8 / 7

Sugar from India.

In casks and cannisters, / In chests and casks from St. Thome, } Tare { 1/4 / 1/5

Oil from Candia.

Tare 29*lb* per barrel.

2. 7*lb* and a half of oil make a gallon; therefore to reduc pounds into gallons, multiply by 2, and divide by 15.

EXAMPLES.

1. In 16 hogsheads of tobacco, each 5 *C.* 1*qr.* 19*lb.* gros tare per hogshead, 100*lb.* how much neat weight? Ans. 72*C* 1*qr.* 20*lb.*

	C.	*qr.*	*lb.*
	5	1	19
			4 by the partı
	21	2	20
			4
gross	86	2	24
tare	14	1	4
neat	72	1	20

16
100
4 . *C. qrs. lb.*
28)1600(57(14 1 14

2. In 70 bales of Smyrna silk, each 317*lb.* gross, tare pe bale 16*lb.* how many *lb.* neat? Ans. 21070*lb.* neat.

3. In 14 hogsheads of tobacco, weighing gross 89*C.* 3*qr* 17*lb.* tare per hogshead 100*lb.* how much neat weight? An 77*C.* 1*qr.* 17*lb.*

4. What is the neat weight of 30 bales of Cyprus silk, eac weighing 249*lb.* gross, tare per bale 14*lb.*? Ans. 7050*lb.*

Case 3.

Q. When the tare is at so much per C. how is the ne weight found?

A. When the tare is an aliquot part or parts of the weight, divide the whole gross by the said part or parts, th the tare is of an C. weight, and the quotient thence arisin gives the tare of the whole; which subtract from the whc gross, the remainder is neat.

Note 1. Figs, almonds, argol, &c. 14*lb.* / Caroteels, butts of currants, &c. 16 / Oil in uncertain casks, &c. 18 } per cent.

2. *Whatever* part the given tare is of an C. weight, the ex *must the whole tare* be of the given gross weight.

EXAMPLES.

1. What is the neat weight of 12 barrels of argol, gross 48*C.* 3*qrs.* 12*lb.* tare 14*lb.* per cent. ? Ans. 42*C.* 3*qrs.*

	C.	*qrs.*	*lb.*	
14=$\frac{1}{8}$)	48	3	12	gross
	6	0	12	tare
	42	3	0	neat

2. In 12 butts of currants, each 7*C.* 1*qr.* 10*lb.* gross, tare per cent. 16*lb.* how much neat weight ? Ans. 75*C.* 1*qr.* 26*lb.* 14*oz.*

3. What is the neat weight of 30 barrels of figs, each 2*C.* 3*qrs.* gross, tare per cent. 14*lb.* Ans. 72*C.* 21*lb.*

Note. When the tare is not the aliquot part or parts of an C. weight, then multiply the pounds gross, by the tare per cent. given, and that product divide by 112, the quotient is the whole tare, which subtract from the gross, the remainder is neat.

4. What is the neat product of 20 barrels of anchovies, each gross 33*lb.* tare per cent. 10*lb.* ? Ans. 601*lb.* 2*oz.*

5. What is the neat product of 17 barrels of potash, each gross 223*lb.* tare 10*lb.* per cwt. ? Ans. 3452*lb.* 9*oz.*

Case 4.

Q. When the tare is at so much in the whole gross weig ht how is the neat weight found ?

A. Subtract the tare from the gross, and the remainder is neat.

EXAMPLES.

1. What is the neat weight of 38 hogsheads of tobacco, weighing gross 201*C.* 3*qrs.* 12*lb.* tare in the whole 3140*lb.* ? Ans. 173*C.* 3*qrs.* 8*lb.*

2. What is the neat weight of 3 hogsheads of tobacco, weighing as follows, viz.

	C.	*qrs.*	*lb.*		*lb.*	
No. 1—	3	1	2		80	
2—	3	2	1	Tare	80	
3—	5	1	12		100 ?	Ans. 9*C.* 3*qrs.* 7*lb.*

Case 5.

Q. How is the neat weight found, when trett is allowed with tare ?

A, Divide the pounds suttle by 26, the quotient is the trett. which subtract from the suttle, the remainder is neat.

EXAMPLES.

1. In 8*C.* 3*qrs.* 20*lb.* gross, tare 38*lb.* trett 4*lb.* per 104*lb.* how many pound neat? Ans. 925*lb.* neat.

2. In 177*C.* 0*qrs.* 22*lb.* gross, tare 9*lb.* per cent. trett 4*lb.* per 104*lb.* how many C. weight neat? Ans. 156*C.* 2*qrs.* 22*lb.*

3. In 17 chests of sugar weighing 120*C.* 2*qrs.* gross, tare 176*lb.* trett 4*lb.* per 104*lb.* how many C. weight neat? Ans. 114*C.* 1*qr.* 12*lb.*

Note. There are other allowances, not so common, such as break, which is at so much per barrel, bag, &c. and damage, which is so much on the whole, but they are very easy.

3. OF APOTHECARIES WEIGHT.

1. In 12℔. 13. 23. 0℈. 1*gr.* how many grains? Ans. 69721 grains.

2. In 69721 grains, how many ℈. ʒ. ℥. and ℔. Ans. 12℔. 13. 23. 0℈. 1*gr.*

OF LONG MEASURE.

1. In 70 miles, how many furlongs and poles? Ans. 560 furlongs, 22400 poles.

2. In 40 yards, how many feet, inches, and barley-corns? Ans. 120 feet, 1440 inches, 4320 barley-corns.

3. In 5 miles, how many barley-corns? Ans. 950400 barley-corns.

4. In 4000 Inches, how many yards? Ans. 111 yds. 4 in.

5. In 4 leagues, how many yards? Ans. 21120 yards.

6. In 15840 yards, how many miles and leagues? Ans. 9 miles, 3 leagues.

7. How many barley-corns in a mile? Ans. 190080 barley-corns.

8. How many times doth the wheel which is 18 feet 6 inches round, turn between London and York, which is 150 miles? Ans. 42810 times, and 180 inches over.

9. How many barley-corns will reach round the globe of the earth, which is 360 degrees, and each degree 69¼ miles? Ans. 4755801600 barley-corns.

OF CLOTH MEASURE.

1. In 14 yards, how many quarters and nails? Ans. 56 quarters, 224 nails.

2. In 17 yds. 1 qr. 2 na. how many nails? Ans. 278 nails.

3. In 4712 nails, how many yards? Ans. 294 yds. 2 qrs.

4. In 47128 nails of Irish cloth, how many pieces, each 12 yards? Ans. 245 pieces, 5 yards, 2 quarters.

5. In 4 pieces of cloth each 14 yards, how weny quarters and nails ? Ans. 224 quarters, 896 nails.

6. In 10 bales of cloth each 10 pieces, each 12 yards, how many yords ? Ans. 1200 yards.

7. In 7000 nails of Holland, how many ells ? Ans. 350 ells

8. Reduce 42 ells into quarters and nails. Facit 210 quarters, 840 nails.

OF LAND MEASURE.

1. In 40 acres, how many roods and perches ? Ans. 160 roods, 6400 perches.

2. In 17a. 3r. 10p. how many perches ? Ans. 2850 p.

3. Reduce 2850 perches into acres. Facit 17a. 3r. 10p.

4. If a piece of ground contains 24 acres, and an inclosure of 17 acres 3 roods be taken out of it, how many perches are here in the remainder ? Ans. 1000 perches.

5. One field contains 7 acres, another 10 acres. and a third 12 acres 1 rood, how many shares of 76 perches each are contained in the whole ? Ans. 61 shares, and 44 perches over

OF LIQUID MEASURE.

1. In 17 gallons how many quarts and pints ? Ans. 68 quarts, 136 pints.

2. In 10 barrels of beer how many gallons and quarts ? Ans. 360 gallons, 1440 quarts.

3. In 4 barrels of ale how many gallons ? Ans. 128 gallons.

4. In 72 hogsheads of beer, how many barrels ? Ans. 108 barrels.

5. In 91 barrels of beer, how many hogsheads ? Ans. 60 hogheads, 36 gallons.

6. If a back contains 30 barrels of beer, how many gallons doth it hold ? Ans. 1080 gallons ?

7. In 4 tons of oil how many hogsheads, gallons and quarts ? Ans. 16 hogsheads, 1008 gallons, 4032 quarts.

8. In 3 hogsheads of brandy, how many half anchors ? Ans. 37 half anchors, 4 gallons.

9. In 1712 gallons of wine, how many hogsheads ? Ans. 27 hogsheads, 11 gallons.

10. If a vinter be desirous to draw off a pipe of canary into bottles, containing pints, quarts, and 2 quarts, and each an equal number, how many must he have ? Ans. 144 of each sort.

OF DRY MEASURE.

1. In 40 quarters of wheat, how many bushels and pecks ? Ans. 320 bushels, 1280 pecks.

2. Reduce 1280 pecks of wheat into quarters. Facit 40 quarters.

3. In 30 chaldron of coals, each 36 bushels, how many pecks? Ans. 4320 pecks.

4. Reduce 7094 pecks of coals, into chaldrons. Facit 49 chaldrons, 9 bushels, 2 pecks.

OF TIME.

1. In 121812 seconds how many hours? Ans. 33 hours, 50 minutes, 12 seconds.

2. Reduce 41 weeks into days, hours and minutes. Facit 287 days, 6888 hours, 413280 minutes.

3. Reduce 413280 minutes into weeks. Facit 41 weeks.

4. How many seconds in a year, allowing it to be 365 days, 6 hours? Ans. 31557600 seconds.

5. How many days have passed since the birth of Christ to Christmas, 1781? Ans. 650 510 days 6 hours,

6. From March 2 to November 19 following (inclusive) how many days? Ans. 263 days.

OF MOTION.

In half a year's time the Sun makes his progress through six signs of the Zodiac, how many degrees, minutes and seconds doth that amount to? Ans. 180 degrees, 10800 minutes, 648000 seconds.

OF THE SINGLE RULE OF THREE.

Q. How many parts are there in the Rule of Three?

A. Two; single or simple, and double, or compound.

Q. By what is the Single Rule of Three known?

A. By three terms which are always given in the question, to find a fourth.

Q. Are any of the terms given to be reduced from one denomination to another?

A. If any of the given terms be of several denominations, they must be reduced into the lowest denomination mentioned.

Q. What do you observe concerning the first and third terms?

A. They must be of the same name and kind.

Q. What do you observe concerning the fourth term?

A. It must be of the same name and kind with the second.

Q. What do you observe of the three given terms taken together?

A. That the 2 first are a supposition, the last is a demand.

Q. How is the third term known?

A. It is known by these, or the like words, What cost? How many? How much?

Q. How many sorts of Proportion are there?

A. Two: Direct and Inverse.

OF DIRECT PROPORTION.

Q. WHAT is Direct Proportion?

A. Direct Proportion is when more requires more, or less requires less.

Q. What do you mean by more requires more?

A. More requires more is when the third term is greater than the first; and therefore requires the fourth term to be greater than the second in the same proportion.

Q. What do you mean by less requires less?

A. Less requires less is when the third term is less than the first; and therefore requires the fourth term to be less than the second in the like proportion.

Q. How is the fourth term in Direct Proportion found?

A. By multiplying the second and third terms together, and dividing the product by the first term.

Q. What proportion doth the fourth number bear to any other?

A. It bears the same proportion to the second, as the third does to the first.

Q. How do you prove questions in the Rule of Three Direct?

A. By changing their order.

EXAMPLES.

1. If 3*oz.* of silver, cost 17*s.* what will 48*oz.* cost? Ans. 13*l.* 12*s.*

Oz. *s.* *oz.*
3 : 17 : 48
17
—— 2|0 *l.* *s.*
3)816(27|2(13 12

2. If 3*lb.* of ginger cost 3*s.* what cost 26*lb.*? Ans. 1*l.* 6*s.*

3. If 2*oz.* of silk cost 2*s.* 6*d.* what cost 7*lb.*? Ans. 7*l.*

4. If one gallon of ale cost 8*d.* what cost 36 gallons? Ans. 1*l.* 4*s.*

5. If 1*lb.* of sugar cost 4½*d.* what cost 48lb.? Ans. 18*s.*

9. If 1*lb.* of sugar cost 4*d.* what cost 1 *C.*? Ans. 1*l.* 1
4*d.*

7. If an *C.* of sugar cost 2*l.* 12*s.* what cost 1*lb.*? Ans. 5
2*qrs.* $\frac{32}{112}$

8. If 1 gallon of beer cost 4*d.* what cost a barrel? A
12*s.*

9. If a pair of stockings cost 2*s.* 3*d.* what cost 19 do
pair? Ans. 25*l.* 13*s.*

10. If 19 dozen pair of shoes cost 25*l* 13*s.* what cost o
pair? Ans. 2*s.* 3*d.*

11 Bought a firkin of butter, containing 56*lb.* for 18*s.* 8
what is that per *lb.*? Ans. 4*d.*

12. Sold 3*C.* weight of tobacco, at 18*d.* per *lb.* what is t
price of the whole? Ans. 25*l.* 4*s.*

13. Bought 19 chaldrons of coals, at 29*s.* 6*d.* per chald
what came they to? Ans. 28*l.* 0*s.* 6*d.*

14 If 1*lb.* of sugar cost 9*d.* what cost 17 *C.* 2*qrs.*? A
73*l.* 10*s.*

15. If 1*oz.* of silver cost 5*s.* 6*d.* what is the price o
tankard that weighs 1*lb.* 10*oz.* 10*dwts.* 4*gr.*? Ans. 6*l.* 3*s.* 6
2*qrs.* $\frac{96}{175}$.

16. If 1*lb.* of tobacco cost 15*d.* what cost 3 hhds weigh
together 15 C 1*qr.* 19*lb.*? Ans. 107*l.* 18s. 9*d.*

17. If a yard of cloth is worth 14*s* what is the worth of
pieces, each 19 yards? Ans. 66*l.* 10*s.*

18. If an ell of holland cost 4*s.* 6*d.* what is the value of
peices, each 12 ells.? Ans. 13*l.* 10*s.*

19. If a bushel of coals cost 10*d.* how many chaldron
100*l.*? Ans. 66*ch.* 24 *bush.*

20. How many quarters of corn for 40 guineas' at 4*s.* p
bushel? Ans. 26*qrs.* 2*bush.*

21 If a man's yearly income be 300*l.* what is it per da
Ans. 16*s.* 5*d.* 1*qr.* $\frac{15}{365}$

22. If a man spend 7 pence per day, how much is that
a year? Ans. 10*l.* 12*s.* 11*d.*

23. If a pint of wine cost 10*d.* what cost 3 hhds? Ans. 6

24. If a pipe of canary cost 40*l.* how much is that
pint? Ans. 9*d.* 2*qrs.* $\frac{96}{1008}$.

25. Bought 12 peicec of cloth each 12 yds. at 10*s.* 6*d.*
yard, what came they to? Ans. 75*l.* 12*s.*

26. What cost 120 yards of cloth, at 3*s.* per yard? Ans. 1

27. A merchant bought 4 pieces of holland, each 12 e
for 7*l.* 10*s.* what did one ell cost? Ans. 3*s.* 1*d.* $\frac{1}{2}$.

28. A grocer bought 3 hhds of sugar, each 10. C. 3qrs. 1
gross, tare 26*lb.* per hhd. at 2*d.*$\frac{1}{2}$ per *lb.* I demand wh
the 3 hhds come to? Ans. 37*l.* 3*s.* 9*d.*

9. How much must I pay for the carriage of 10½C. at the
e of 1*d.* ½ per *lb.*? Ans. 7*l.* 7*s.*
0. If 6 horses eat up 21 bushels of oats in a week's time,
w many bushels will serve 20 horses the same time? Ans.
bushels.
1. If a family of 10 persons spend 3 bushels of malt in a
nth, how many bushels will serve them, when they are 30 in
mily? Ans. 9 bushels.
2. If an ingot of silver weighs 36*oz.* 10*dwt.* what is it worth
s. per oz.? Ans. 9*l.* 2*s.* 6*d.*
3. How many yards of lace for 100*l.* at 3*s.* 6*d.* per yard?
. 571 yards ½½.
4. If a merchant hath owing to him 1000*l.* and his debtor
h agree to pay him for every pound 12*s.* 6*d.* I demand how
ch he must pay in all? Ans. 625*l.*
5. A goldsmith sold a tankard for 10*l.* 12*s.* at the rate of 5*s.*
per oz. I demand the weight of it? Answer, 39*oz.*
wts.
6. A man bought a piece of cloth for 16*l.* 10*s.* at 15*s.* per
l, how many yards did it contain? Ans. 22*yds.*
7. If 1*C.* weight of cheese cost 37*s.* 4*d.* what is that per *lb.*?
. 4*d.*
8. Coals at 33*s.* per chaldron, how much per bushel? Ans.

9. What cost 49392 case knives, at 4*s.* 4*d.* per dozen?
. 891*l.* 16*s.*
0. If a gentleman has an estate of 245*l.* 10*s.* a year, how
ch may he spend one day with another, to lay up 60 guineas
he year's end? Ans. 10*s.* per day.
1. If 17*C.* 2*qrs.* 17*lb.* of tobacco cost 133*l.* 13*s.* 4*d.* what cost
.? Ans. 1*d.*
2. If 1*C.* weight of lead cost 15*s.* 11*d.* what cost 5 fother?
. 77*l.* 11*s.* 10*d.* ½.
3. When the tun of wine cost 42*l.* what cost 1 quart? Ans.

4. At a noble per week, how many months board may I
e for 50*l.*? Ans. 37 months and 2 weeks.
5. What cost a pack of wool, weighing 2*C.* 1*qr.* 19*lb.* at 8*s.*
per stone? Ans. 8*l.* 4*s.* 6*d.* 1*qr.* ¼¼.
6. What is cheese per *C.* weight, at 3*d.* ½ per lb.? Ans.
12*s.* 8*d.*
7. If a yard of cambric cost 12*s.* what cost 4 pieces, each 20
ls? Ans. 48*l.*
8. If a yard of broad cloth cost 18*s.* what cost 5 pieces, each
rards? Ans. 90*l.*

49. If lead be sold for 1*d.* ½ per *lb.* what is 3*C.* worth ? Ans. 2*l.* 2*s.*

50. If coffee be sold for 8*d.* ½ per *oz.* what is 6*C.* worth ? Ans. 369*l.* 12*s.*

51. What cost a hhd. of sugar weighing gross, 17*C.* 12*lb.* tare, 14*lb.* per Cwt. at $11 25*c.* per *C.* neat ? Ans. $175 78½*c.*

52. If 12 yards of linen cost $9 72*c.* what will 56 yards cost ? Ans. $45 36*c.*

53. If 56 yards cost $45 36*c.* what will be the price of 12 yards ? Ans. $9 72*c.*

54. If 12 yards cost $9 72*c.* how much can be bought with $45 36*c.* ? Ans. 56 yards.

55. At 27 *cents* per yard, how much calico can I have for $22 ? Ans. 81⅓⅓ *yds.*

56. What will 7*C.* 3*qrs.* 10*lb.* of sugar come to at 13 *cents* per *lb.* ? Ans. $114 14*c.*

57. What will 7*C.* 3*qrs.* 10*lb.* of sugar come to at $10 50 per cwt. ? Ans $82 31½*c.*

58. What will 17*yds.* 3*qrs.* 2*n.* of cloth come to at $8 75 per yard ? Ans. 156 40½*c.*

59. What will 7*a.* 2*r.* 25*p.* of land come to at $35 per acre ? Ans. $267 96½*c.*

60. What will 7*lb.* 10*oz.* 14*dwt.* of silver come to at 4 *cents* per oz. ? Ans. $85 23*c.*

2. OF INVERSE PROPORTION.

Q. What is Inverse Proportion ?

A. Inverse Proportion is when more requires less, or less requires more.

Q. What is meant by more requires less ?

A. More requires less, is when the third term is greater than the first, and requires the fourth term to be less than the second.

Q. What is meant by less requires more ?

A. Less requires more, is when the third term is less than the first, and requires the fourth term to be greater than the second.

Q. How is the fourth term in Inverse Proportion found ?

A. By multiplying the first and second terms together, and dividing that product by the third term.

Q. What proportion does the fourth term bear to any of the rest ?

It bears such proportion to the second, as the first o the third.

EXAMPLES.

f 48 men can build a wall in 24 days, how many men the same in 192 days? Ans. 6 men.

f I lent my friend 100*l.* for 6 months (allowing the to be 30 days) how long ought he to lend me 1000*l.* uite my kindness? Ans. 18 days.

f 100*l.* in 12 months gain 6*l.* interest, what principal ain the same in 8 months? Ans. 150*l.*

If a footman performs a journey in 3 days when the are 16 hours long, how many days will he require of urs long to go the same journey in? Ans. 4 days.

How many yards of matting, that is half a yard wide, over a room that is 18 feet wide, and 30 feet long 120 yards.

If 28*s.* will pay for the carriage of an *C.* weight 150 , how far may 6 *C.* weight be carried for the same mo- Ans. 25 miles.

How much in length that is 3 inches broad, will make t square? Ans. 48 inches.

If 15 shillings worth of wine will serve 46 men, when tun is worth 12*l.* how many men will the same 15 shil- s worth suffice, when the tun is worth but 8*l.*? Ans. 69

. If when the price of a bushel of wheat is 6*s.* 3*d.* the ny-loaf will weigh 9*oz.* what must the penny-loaf weigh, n wheat is at 4*s.* 6*d.* per bushel? Ans. 12*oz.* 10*dwts.*

). Suppose 800 soldiers were placed in a garrison, and r provisions were computed sufficient for two months; many soldiers must depart, that the provisions may re them 5 months? Ans. 480 men.

1. There is a cistern, having a cock, which will empty 12 hours; I demand how many cocks of the same ca- ty there must be to empty it in a quarter of an hour? . 48 cocks.

2. There was a certain building raised in 8 months by workmen, but the same being demolished, it is required e re-built in 2 months. I demand how many men must employed about it? Ans. 480 men

OF PRACTICE.

Q. What is Practice?

A. It is a short way of finding the value of any quantity goods, by the given price of one integer.

Q. How do you prove questions in Practice?

A. By the Single Rule of Three Direct: or Practice may be proved by itself, by varying the parts.

THE TABLES.

s.	*d.*
½	is 6
⅓	4
¼	3
⅙	2
⅛	1½
1/12	1

£.	*s.*	*d.*
½	is 10	0
⅓	6	8
¼	5	0
⅕	4	0
⅙	3	4
⅛	2	6
1/10	2	0
1/12	1	8

£.	*s.*	*d.*
1/15	is 1	4
1/16	1	3
1/20	1	0
1/30	0	8
1/40	0	6
1/60	0	4
1/80	0	3
1/120	0	2

Cwt.	
½	is
¼	
⅛	
1/16	
1/20	

Case 1.

Q. What must be done with the price of an integer, wh it is less than a penny?

A. Find the aliquot parts of that price contained in a pe ny, which must be divisors to the given sum; that is, if t price be a farthing, say a farthing is the fourth of a pen and set it thus: ¼ | ¼ |. If the price be a half-penny, th say a half-penny is the half, thus: ½ | ½ |. If it be thr farthings, then say, a half-penny is the half of a penny, a farthing is the fourth of a penny, thus: | ½ | ¼ | ¼ |

Q. What do you observe concerning these columns?

A. The first column contains the money, and the oth the parts.

Note 1. When there are more aliquot parts than one, th quotients must be added together, and the sum, if the first a quot part be taken from a penny, will be pence: if it be tak from a shilling, will be shillings, or if it be taken from a pou will be pounds.

2. It is frequently better to take parts of parts, than pa of the whole price; and then the three farthings above m tioned may as well be taken thus: | ½ | ¼ | ¼ | that is, a h penny, *is the half* of a penny, and a farthing is the half of a h penny.

EXAMPLES.

¼ | 7 6 1 2 at ¼		1280 at ¼
12 | 1 9 0 3		Facit 1*l.* 6*s.* 8*d.*
20 | 1 5 | 8 7		
7*l.* 18*s.* 7*d.*		
½ | 6 8 1 2 at ½		7672 at ½
12 | 3 4 0 6		Facit 15*l.* 19*s.* 8*d.*
20 | 2 8 | 3 10		
14*l.* 3*s.* 10*d.*		
¼ | 4 7 1 2 at ¾		9180 at ¾
½ | 2 3 5 6		Facit 28*l.* 13*s.* 9*d.*
½ | 1 1 7 8		
12 | 3 5 3 4		
20 | 2 9 | 4 6		
14*l.* 14*s.* 6*d.*		

Case 2.

Q. What must be done with the price of an integer, when s less than a shilling ?

A. Find the aliquot parts of that price contained in a shil-g, which must be divisors to the given sum. Or thus, f the given price be not the aliquot part of a shilling, then t take some part of it that is an aliquot part ; and for the naining part of the price, let it be taken out of the forego- part or parts, and then add the quotients together as be- ; the total will be the answer in shillings.

EXAMPLES.

1/12 | 7 6 1 2 at 1*d.*		1 1/12 | 8 6 1 2 at 1*d.* ¼
20 | 6 3 | 4 4		¼ ¼ | 7 1 7 8
3*l.* 14*s.* 4*d.*		1 7 9 5
		20 | 8 9 | 7 1
		4 4*l.* 17*s.* 1*d.*

6812 at 1*d.*
Facit 28*l.* 7*s.* 8*d.*

1861 at 1*d.* ¼
Facit 9*l.* 13*s.* 10*d.* ¼

4121 at 1*d.* ½
Facit 25*l.* 15*s.* 1*d.* ½

1861 at 1*d.* ¾
Facit 13*l.* 11*s.* 4*d.* ¾

4761 at 2*d.*
Facit 39*l.* 13*s.* 6*d.*

6181 at 2*d.* ¼
Facit 57*l.* 18*s.* 11*d.* ¼

1218 at 2*d.* ½
Facit 12*l.* 13*s.* 9*d.*

8012 at 2*d.* ¾
Facit 91*l.* 16*s.* 1*d.*

7612 at 3*d.*
Facit 95*l.* 3*s.*

6128 at 3*d.* ¼
Facit 82*l.* 19*s.* 8*d.*

6180 at 3*d.* ½
Facit 90*l.* 2*s.* 6*d.*

7812 at 3*d.* ¾
Facit 122*l.* 1*s.* 3*d.*

8120 at 4*d.*
Facit 135*l.* 6*s.* 8*d.*

7000 at 4*d.* ¼
Facit 123*l.* 19*s.* 2*d.*

6001 at 4*d.* ½
Facit 112*l.* 10*s.* 4*d.* ½

7121 at 4*d.* ¾
Facit 140*l.* 18*s.* 8*d.* ¾

7181 at 5*d.*
Facit 149*l.* 12*s.* 1*d.*

8121 at 5*d.* ¼
Facit 177*l.* 12*s.* 11*d.*

6128 at 5*d.* ½
Facit 140*l.* 8*s.* 8*d.*

6100 at 5*d.* ¾
Facit 146*l.* 2*s.* 11*d.*

1000 at 6*d.*
Facit 25*l.*

7610 at 6*d.* ¼
Facit 198*l.* 3*s.* 6*d.* ½

1218 at 6*d.* ½
Facit 32*l.* 19*s.* 9*d.*

6000 at 6*d.* ¾
Facit 168*l.* 15*s.*

7101 at 7*d.*

Facit 207*l.* 2*s.* 3*d.*

1001 at 7*d.* ¼

Facit 30*l.* 4*s.* 9*d.* ¼

4100 at 7*d.* ½

Facit 128*l.* 2*s.* 6*d.*

6120 at 7*d.* ¾

Facit 197*l.* 12*s.* 6*d.*

7100 at 8*d.*

Facit 236*l.* 13*s.* 4*d.*

6100 at 8*d.* ¼

Facit 209*l.* 13*s.* 9*d.*

8000 at 8*d.* ½

Facit 283*l.* 6*s.* 8*d.*

6000 at 8*d.* ¾

Facit 218*l.* 15*s.*

9000 at 9*d.*

Facit 337*l.* 10*s.*

4121 at 9*d.* ¼

Facit 158*l.* 16*s.* 7*d.* ¼

6100 at 9*d.* ½

Facit 241*l.* 9*s.* 2*d.*

5918 at 9*d.* ¾

Facit 240*l.* 8*s.* 4*d.* ½

8121 at 10*d.**

Facit 338*l.* 7*s.* 6*d.*

6712 at 10*d.* ¼

Facit 286*l.* 13*s.* 2*d.*

1002 at 10*d.* ½

Facit 43*l.* 16*s.* 9*d.*

4680 at 10*d.* ¾

Facit 209*l.* 12*s.* 6*d.*

1260 at 11*d.*

Facit 57*l.* 15*s.*

6121 at 11*d.* ¼

Facit 288*l.* 18*s.* 5*d.* ¼

1234 at 11*d.* ½

Facit 59*l.* 2*s.* 7*d.*

2345 at 11*d.* ¾

Facit 114*l.* 16*s.* 1*d.* ¾

100 at 11*d.* ¾

Facit 4*l.* 17*s.* 11*d.*

*Note. When the price of an integer is 10*d.* annex a cypher to the given number, and divide by 12 and by 20.

Case 3.

Q. What must be done with the price of an integer wh it is greater than a shilling, but less than two shillings?

A. Let the part or parts be taken only with so much of t given price as is more than one shilling; that is, if the pri be 14*d.* ¼, take the parts only with 2*d.* ¼, and let the giv quantity stand for shillings, which must be added with t rest; and the total will be the answer in shillings.

EXAMPLES.

¼ ¼	4 8 6 at 12*d.* ¼	6121 at 13*d.*
12	1 2 1 ¼	Facit 331*l.* 11*s.* 1*d.*
	1 0 1 ¼	1281 at 13*d.* ¼
2|0	4 9 | 6 1 ¼	Facit 70*l.* 14*s.* 5*d.* ¼
	24*l.* 16*s.* 1*d.* ¼	6100 at 13*d.* ¼
½ ½	4 8 6 at 12*d.* ½	Facit 343*l.* 2*s.* 6*d.*
12	2 4 3	1210 at 13*d.* ¾
	2 0 3	Facit 69*l.* 6*s.* 5*d.* ½
2|0	5 0 | 6 3	1210 at 14*d.*
	2 5*l.* 6*s.* 3*d.*	Facit 70*l.* 11*s.* 8*d.*
	7612 at 12*d.* ¼	1271 at 14*d.* ¼
	Facit 388*l.* 10*s.* 7*d.*	Facit 75*l.* 9*s.* 3*d.* ¾
	1216 at 12*d.* ½	6120 at 14*d.* ½
	Facit 63*l.* 6*s.* 8*d.*	Facit 369*l.* 15*s.*
	1216 at 12*d.* ¾	1210 at 14*d.* ¾
	Facit 64*l.* 12*s.*	Facit 74*l.* 7*s.* 3*d.* ½
		1260 at 15*d.*
		Facit 78*l.* 15*s.*

12 at 15*d.* ¼
t 102*l.* 8*s.* 7*d.*

10 at 15*d.* ½
t 78*l.* 2*s.* 11*d.*

12 at 15*d.* ¾
t 499*l.* 10*s.* 9*d.*

00 at 16*d.*
t 406*l.* 13*s.* 4*d.*

21 at 16*d.* ¼
t 482*l.* 3*s.* 0*d.* ¼

18 at 16*d.* ½
t 83*l.* 14*s.* 9*d.*

00 at 16*d.* ¾
: 565*l.* 6*s.* 3*d.*

28 at 17*d.*
: 292*l.* 8*s.*

30 at 17*d.* ¼
t 88*l.* 8*s.* 1*d.* ½

40 at 17*d.* ½
t 170*l.* 12*s.* 6*d.*

50 at 17*d.* ¾
: 255*l.* 3*s.* 1*d.* ½

60 at 18*d.*
: 342*l.*

5670 at 18*d.* ¼
Facit 431*l.* 3*s.* 1*d.* ½

6789 at 18*d.* ½
Facit 523*l.* 6*s.* 4*d.* ½

7890 at 18*d.* ¾
Facit 616*l.* 8*s.* 1*d.* ½

8900 at 19*d.*
Facit 704*l.* 11*s.* 8*d.*

9000 at 19*d.* ¼
Facit 721*l.* 17*s.* 6*d.*

9876 at 19*d.* ½
Facit 802*l.* 8*s.* 6*d.*

8765 at 19*d.* ¾
Facit 721*l.* 5*s.* 8*d.* ¾

7120 at 20*d.* ¼
Facit 600*l.* 15*s.*

6543 at 20*d.* ½
Facit 558*l.* 17*s.* 7*d.* ½

5432 at 20*d.* ¾
Facit 469*l.* 12*s.* 10*d.*

4321 at 21*d.*
Facit 378*l.* 1*s.* 9*d.*

3210 at 21*d.* ¼
Facit 284. 4*s.* 4*d.* ½

2100 at 21*d.* ½	6812 at 22*d.* ¾
Facit 188*l.* 2*s.* 6*d.*	Facit 645*l.* 14*s.* 5*d.*
1000 at 21*d.* ¾	1210 at 23*d.*
Facit 90*l.* 12*s.* 6*d.*	Facit 115*l.* 19*s.* 2*d.*
1090 at 22d.*	1800 at 23*d.* ½
Facit 99*l.* 18*s.* 4*d.*	Facit 174*l.* 7*s.* 6*d.*
9010 at 22*d.* ¼	6760 at 23*d.* ½
Facit 835*l.* 6*s.* 0*d.* ½	Facit 661*l.* 18*s.* 4*d.*
6700 at 22*d.* ½	9990 at 23*d.* ¾
Facit 628*l.* 2*s.* 6*d.*	Facit 988*l.* 11*s.* 10*d.* ½

* Note. When the price of an integer is 22*d.* annex a cyph to the given number, and divide by 12, (as t 10*d.*) then a both lines together: the sum will be the total in shillings.

Case 4.

Q. What must be done with the price of an integer, wh it is any even number of shillings under 20*s.* as 6*s.* 8*s.* &c.

A. Multiply the given quantity by half of the price, a double the first figure of the product for shillings, and t rest of the product will be pounds.

Note. This rule is taken from an operation in Decimals.

EXAMPLES.

486 at 2*s.*	1286 at 4*s.*
1	
48*l.* 12*s.*	Facit 257*l.* 4*s.*
769 at 4*s.*	7618 at 6*s.*
2	
153*l.* 16*s.*	Facit 2285*l.* 8*s.*
7612 at 2*s.*	191 at 8*s.*
Facit 761*l.* 4*s.*	Facit 76*l.* 8*s.*

180 at 10*s.**	171 at 16*s.*
Facit 90*l.*	Facit 136*l.* 16*s.*
171 at 14*s.*	712 at 18*s.*
Facit 119*l.* 14*s.*	Facit 640*l.* 16*s.*

Note. When the price of an integer is 10*s.* you may take of the given integers, and it is done: and the remainder (if e be any) will be 10*s.*

Case 5.

Q. What must be done with the price of an integer, when s any odd number of shillings, under 20*s.* as 3*s.* 5*s.* &c.

A. Multiply the given integers by the price, and that proct divide by 20, and the quotient will be the answer.

EXAMPLES.

121 at 1*s.*	121 at 11*s.*
Facit 6*l.* 1*s.*	Facit 66*l.* 11*s.*
121 at 3*s.*	600 at 13*s.*
Facit 18*l.* 3*s.*	Facit 390*l.*
471 at 5*s.**	190 at 15*s.*
Facit 117*l.* 15*s.*	Facit 142*l.* 10*s.*
860 at 7*s.*	121 at 17*s.*
Facit 301*l.*	Facit 102*l.* 17*s.*
612 at 9*s.*	100 at 19*s.*
Facit 275*l.* 8*s.*	Facit 95*l.*

* Note. When the price of an integer is 5*s.* the work ma done at once: because 5*s.* is the fourth part of a pound.

Case 6.

Q. What must be done with the price of an integer, it is shillings and pence?

A. 1. If the shillings and pence be the aliquot pa pound, it may be done at once, as 6 8*d.* is the thir pound

EXAMPLES.

12 at 6*s.* 3*d.*	21 at 2*s.* 6*d.*
Facit 4*l.*	Facit 2*l.* 12*s.* 6*d.*
65 at 3*s.* 4*d.*	96 at 1*s.* 8*d.*
Facit 11*l.* 10*s.*	Facit 8*l.*

If the shillings and pence be not the aliquot part [illegible] and, or if there be shillings, pence and farthings, mul[illegible] given quantity by the shillings, and take parts with [illegible] and add them together: the sum will be the answe[illegible] shillings.

EXAMPLES.

[illegible] 6 at 9*s.* 3*d.*	70 at 7*s.* 4*d.* $\frac{3}{4}$
[illegible]	Facit 25*l.* 17*s.* 8*d.* $\frac{1}{2}$
[illegible] 6	55 at 4*s.* 8*d.* $\frac{1}{2}$
[illegible] 6 | 5 6	Facit 12*l.* 18*s.* 11*d.* $\frac{1}{2}$
58*l.* 5*s.* 6*d.*	77 at 10*s.* 6*d.* $\frac{1}{4}$
83 at 6*s.* 10*d.*	Facit 40*l.* 10*s.* 1*d.* $\frac{1}{4}$
Facit 29*l.* 7*s.* 8*d.*	12 at 13*s.* 10*d.* $\frac{1}{2}$
10 at 12*s.* 4*d.*	Facit 8*l.* 6*s.* 6*d.*
Facit 6*l.* 3*s.* 4*d.*	17 at 17*s.* 4*d.* $\frac{1}{4}$
30 at 4*s.* 9*d.*	Facit 14*l.* 15*s.* 0*d.* $\frac{1}{4}$
Facit 7*l.* 2*s.* 6*d.*	46 at 7*s.* 3*d.* $\frac{3}{4}$
73 at 7*s.* 6*d.*	Facit 16*l.* 16*s.* 4*d.* $\frac{1}{2}$
Facit 27*l.* 7*s.* 6*d.*	

Case 7.

Q. What must be done with the price of an integer, whe it is pounds only?

A. Multiply the given integers by the price, the produ will be the answer.

EXAMPLES.

72 at 5*l.*

Facit 360*l.*

64 at 3*l.*

Facit 192*l.*

19 at 4*l.*

Facit 76*l.*

46 at 7*l.*

Facit 322*l.*

Case 8.

What must be done with the price of an integer, when pounds and shillings?

Multiply the integers given by the pounds; then pro- with the shillings, if they are even, according to Case but if they are odd, according to Case 5, add them to er; the total will be the answer.

EXAMPLES.

26 at 4*l.* 8*s.*

4

104

10 6

114*l.* 8*s.*

49 at 3*l.* 7*s.*

7

2|0 34 | 3

17 3

147

164*l.* 3*s.*

36 at 5*l.* 13*s.*

Facit 203*l.* 8*s.*

48 at 7*l.* 10*s.*

Facit 360*l.*

26 at 11*l.* 14*s.*

Facit 304*l.* 4*s.*

15 at 4*l.* 13*s.*

Facit 69*l.* 15*s.*

17 at 9*l.* 15*s.*

Facit 165*l.* 15*s.*

16 at 3*l.* 6*s.*

Facit 52*l.* 16*s.*

Case 9.

What must be done with the price of an integer, when pounds shillings and pence?

1. If the shillings and pence be the aliquot part of a d, multiply the given integers by the pounds, and divi-

by the aliquot part: those numbers, so found out, be
ded together, will be the sum required.

EXAMPLES.

47 at 3*l.* 3*s.* 4*d.*	17 at 2*l.* 6*s.* 8
Facit 148*l.* 16*s.* 8*d.*	Facit 39*l.* 13*s.* 4
20 at 4*l.* 13*s.* 4*d.*	30 at 1*l.* 2*s.* 6
Facit 93*l.* 6*s.* 8*d.*	Facit 33*l.* 15*s.*

2. If the shillings and pence be not the aliquot p
pound, or if there be shillings, pence and farthing
with the pounds, then reduce the pounds and shilli
shillings, and multiply the given integers by the sa
lings; next take parts with the rest of the price,
them together as before.

EXAMPLES.

3	1/4	120 at 4*l.* 7*s.* 4*d.* 1/2	21 at 5*l.* 14*s.*
		87 20	Facit 120*l.* 6*s.*
		10440 87	
1/2	1/6	30	
		5	70 at 1*l.* 14*s.*
	2	1047 | 5	Facit 121*l.* 0*s.*
		523*l.* 15*s.*	
		14 at 2*l.* 10*s.* 6*d.*	46 at 3*l.* 19*s.*
		Facit 35*l.* 7*s.*	Facit 183*l.* 6*s.*

Q. What other way have you of answering que
this case?

A. 1. When the number of integers does not ex
multiply the price by the integers, as in Compoun
plication, the product will be the answer.

2. When the number of integers does exceed 12,
the price by the parts instead of the whole, or,

3. You may multiply the price by the whole nu
integers. Thus,

58361 hhds. of tobacco, at 48*l.* 12*s.* 9*d.* per hhd.

l.	*s.*	*d.*
48	12	9
	58361	

				MEMORANDUM.			
				1.	2.	3.	4.
48	12	9		*s. d.*	*s. d.*	*s. d.*	*s. d.*
2918	5	0		16 6			
4591	5	0		18 3	2 6	0 0	0 0
9100	0	0		2 0			
1875	0	0		3 9	17 6	15 0	10 0
8533	2	9					

low is it wrought?

ultiply by the several figures in the multiplier, as in und Multiplication, but with this difference, that the t of the shillings and pence multiplied by the 6, 3, 8, must be placed by themselves in a memorandum, product of the pounds by the same figures, placed as ple Multiplication: thus,

l.	*s.*	*d.*
48	12	9
	58361	

luct - - -	48	12	9	*Memor.*
- - - - -	291			16 6
- - - - - -	145			18 3
- - - - -	389			2 0
- - - - -	243			3 9

n to fill up the blanks in the second product, take half 16*s.* in the memorandum, which is 8*s.* and set it in the place of pounds. Annex a cypher to the 6*d.* which 60*d.* or 5*s.* place this under the shillings, and the line e with, there being no pence remaining.

the blanks in the third product, take half of the 18*s.* memorandum, and put it in the tens place of the s. Annex a cypher to the 3*d.* which makes it 30*d.* or . this put in the second memorandum. Then take half 2*s.* in this new memorandum, and put it in the units of the pounds. Annex a cypher to the 6*d.* in the new randum, which makes 60*d.* or 5*s.* put this in the place lings, and this line is finished, there being no pence ing.

For the blanks in the fourth product, take half of t
the first memorandum, and put it in the hundreds
the pounds; and because there remains nothing,
there any pence in the memorandum, therefore fi
other blanks with cyphers, and the line is finished.

For the blanks in the fifth product, take half of the
first memorandum, and put it in the thousands pla
pounds; then because there is one remaining, put th
second memorandum. Annex a cypher to the 9
makes 90*d.* or 7*s.* 6*d.* put this to the former 1; and
17*s.* 6*d.* take half of the 17*s.* and put it in the hundr
of the pounds: then because there is one remaining
in the third memorandum. Annex a cypher to the
it makes 60*d.* or 5*s.* put this to the 1 in the third m
dum, and it makes 15*s.* take half the 15*s.* and put
tens place of the pounds; then, because there remai
it in the fourth memorandum, and since there are
in the third memorandum, to put a cypher to, let
be annexed to the 1 in the last memorandum, whic
10*s.* take half of this 10*s.* and put it in the units pla
pounds; then, because there are no pence in the m
dum, neither is there any thing remaining of the 1C
fore fill up the other blanks with cyphers, and th
completed: add all together, and their sum is the t
duct of the whole.

	l.	*s.*	*d.*				*Mem*	
7000 hhds. of wine at	17	14	8	per hhd.				
		7000				1		2
					s.	*d.*	*s.*	*d*
	124133	6	8		2	8	6	

Note 1. To fill up the blanks in the pounds of the seco
&c. products, always take half of the shillings in the
dum, and if 1 remains, make a new memorandum of it

2. Always annex a cypher to the pence, and whatev
shillings they make, put them to the 1 in the new men
and so on till all the blanks in the pounds are filled up
be any pence yet remaining in the memorandum, put
to them, and what shillings and pence they make let
put in the shillings and pence place in the product.

3. All the Examples in this case, and case 8, may se
instead of others

EXAMPLES.

		l.	*s.*				*l.*	*s.*	*d.*
tobacco, at 4		12	per Cwt.			Facit 59	6	1	1½+
r	½	12							
		55	4						
ł	½	2	6						
6	¼	1	3						
		0	13	1½+					
		59	6	1½+					

		l.	*s.*	*d.*			*l.*	*s.*	*d.*
f tobacco,	at	3	14	0	per *C.*	Facit	46	14	3
f sugar,	at	2	2	6	per *C.*	Facit	38	1	6½
f soap,	at	3	12	0	per *C.*	Facit	15	16	3½
f tallow,	at	1	19	6	per *C.*	Facit	19	19	2½
f tobacco,	at	2	17	0	per *C.*	Facit	14	19	3
f sugar,	at	2	18	6	per *C.*	Facit	13	17	10½
f sugar,	at	3	16	0	per *C.*	Facit	27	4	10½
f tobacco,	at	2	18	6½	per *C.*	Facit	16	7	2½
f tobacco,	at	3	15	9¼	per *C.*	Facit	27	18	9½
f tallow,	at	4	10	4½	per *C.*	Facit	43	19	6
18*lb.*	at	$10	25*c.*		per *C.*	Ans.	$188	70	9
3*qrs.* 20*lb.*	at	$25	50*c.*		per *T.*	Ans.	$201	35	7
8*lb.* 14*oz.*	at	$14	80*c.*		per *C.*	Ans.	$139	39	3
14*dr.*	at	$1	25*c.*		per *lb.*	Ans.	$6	86	3
15*dwt.*	at	$18	50*c.*		per *lb.*	Ans.	$178	44	6
wt. 19*grs.*	at	$1	18*c.*		per *oz.*	Ans.	$21	10	9
. 3*n.*	at	$4	75*c.*		per *yd.*	Ans.	$253	82	6
9*p.*	at	$64	50*c.*		per *ac.*	Ans.	$6215	78	4
17½*lb.*	at	$15	25*c.*		per *C.*	Ans.	$280	69	4
	at	$7	53*c.*			Ans.	$13508	82	
	at		24 *cents.*			Ans.	$235	92	
	at	$8	54*c.*			Ans.	$48054	58	
	at	$1	12*c.*			Ans.	$817	4	
22*lb.*	at	4*l.*			per *C.*	Ans.	234*l.*	15	8½
3*qrs.* 26*lb.* 10*oz.* 12*dr.*	at	$60			p. *T.*	Ans.	$4796	96	2
2*qrs.* 18*lb.*	at	$10			per *C.*	Ans.	$746	60	6
15*dwt.* 14*grs.*	at	5*l.*	2*s.*	6*d.*	per *lb.*	Ans.	38*l.*	6	10
wt. 17*grs.*	at	7*s.*	8*d.*		per *oz.*	Ans.	5*l.*	14	1½
. 2*n.*	at	4*l.*	3*s*	8*d.*	per *yd.*	Ans.	68*l.*	10	0½
3*po.*	at	22*l.*	12*s.*	6*d.*	per *ac.*	Ans.	153*l.*	13	7½

7*lb.* 7*oz.* 3*dr.* 1*sc.* 18*gr.*	at $47 50*c.* per *lb.*	Ans. $362	00
83*yds.* 0*qr.* 3*n.*	at $5 50*c.* per *yd.*	Ans. $457	53
17*E.E.* 2*qrs.* 3*n.*	at $5 50*c.* per *E.E.*	Ans. $96	52
17*E.F.* 2*qrs.* 3*n.*	at $5 50*c.* per *E.F.*	Ans. $98	54
15*gal.* 3*qts.* 1*pt.*	at $1 25*c.* per *gal.*	Ans. $19	84
87*gal.* 1*qt.* 1*pt.*	at 7*s.* 8*d.* per *gal.*	Ans. 33*l.*	9 10

OF INTEREST.

Q. How many kinds of interest are there ?
A. Two : Simple and Compound.

OF SIMPLE INTEREST.

Q. What is Simple Interest ?
A. Simple Interest is the profit allowed in the lending or for bearance of any sum of money, for some determined space o time.

Q. What is the Principal ?
A. The principal is any sum of money lent, for which Inte rest is to be received.

Q. What is the rate per cent. ?
A. It is a certain sum agreed on between the lender and th borrower, to be paid for every 100 pounds, for the use of th Principal, which according to the laws of England, ought not t be above 5*l.* for the use of 100*l.* for 1 year, and 10*l.* for the us of 100*l.* for 2 years ; and so on for any sum of money, in pro portion to the time proposed.

Q. What is the amount ?
A. It is the principal and interest added together.

Q. What other things is Interest applicable to ?
A. It is applied to Commission or Provision, Brokage, Sto age, and Insurance, which have no respect to time.

Case 1.

Q. How do you find the interest of any given sum for year ?
A. Multiply the principal by the rate per cent. and divid that product by 100, the quotient is the interest required.

Q. How do you find the interest of any given sum for sever years ?
A. Multiply the interest for one year by the number of yea given in the question ; the product will be the answer.

EXAMPLES.

1. If 100*l.* in one year's time yield 5*l.* interest, what will 6*l.* yield in the same time? Ans 24*l.* 6*s.*

l.
486
5
24 | 30
20
6 | 00

2. What is the interest of 220*l.* for a year, at 4 per cent. per ann.? Ans. 8*l.* 16*s.*

3. What is the interest of 76*l.* for two years, at 5 per cent. per ann? Ans. 7*l.* 12*s.*

4. What is the amount of 400*l.* for 12 years, at 6 per cent. per ann.? Ans. 688*l.*

5. What is the interest of $128 50*c.* for 3 years, at 7 per cent. per ann.? Ans. $26 98 5.

6. What is the amount of $345 96*c.* for 4 years, at 7 per cent. per ann.? Ans. $1082 83 8.

OF FACTORS' ALLOWANCES, COMMONLY CALLED COMMISSION OR PROVISION.

Q. WHAT is commission or provision?

A. It is an allowance from merchants to their factors or agents beyond the seas in the buying or selling of any sorts of goods; and is a certain rate per cent. according to the custom of the country where the factor resides.

EXAMPLES.

7. My factor sends me word, that he has bought goods to the value of 500*l.* 13*s.* 6*d.* upon my account; I demand that his commission comes to at $3\frac{1}{2}$ per cent.? Ans. 17*l.* 10*s.* 0*d.* 2*qrs.* $\frac{6}{160}$.

8. My correspondent has disbursed upon my account, the sum of 1009*l.* 18*s.* what must he demand for his commission when I allow him $2\frac{1}{4}$ per cent.? Ans. 22*l.* 14*s.* 5*d.* 1*qr.* $\frac{36}{160}$.

9. Suppose I allow my correspondent $1\frac{3}{4}$ per cent. for provision; what may he demand on the disbursement of 704*l.* 5*s.* 4*d.*? Ans. 12*l.* 6*s.* 8*d.* $\frac{3}{160}$.

Case 2.

Q. How do you find the interest of any sum for $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of a year, besides the number of years given in the question?

A.

A. For $\frac{1}{4}$ of a year, take a fourth part of the interest for one year; for $\frac{1}{2}$ a year, take half of the interest for one year; for $\frac{3}{4}$ of a year take the parts compounded of $\frac{1}{2}$ and $\frac{1}{4}$, and add them to the interest for the rest of the time; the sum will be the interest required.

EXAMPLES.

1. What is the interest of 200*l.* for 3 years and $\frac{3}{4}$, at 5 per cent. per annum? Ans. 37*l.* 10*s.*

200	$\frac{1}{2}$ $\frac{1}{2}$	10
5		3
10|00		30
	$\frac{1}{4}$ $\frac{1}{2}$	5
		2 10
		37*l.* 10*s.*

2. What is the interest of 468*l.* 12*s.* 4*d.* for one year and $\frac{3}{4}$, at 6 per cent. per annum? Ans. 49*l.* 4*s.* 1*d.*

3. What is the interest of 112*l.* 10*s.* 4*d.* for 5 years and $\frac{1}{2}$, at 6 per cent. per annum? Ans. 37*l.* 2*s.* 7*d.* $\frac{1}{2}$.

4. What is the interest of 468*l.* for 4 years and $\frac{1}{4}$, at 6 per cent. per annum? Ans. 119*l.* 6*s.* 9*d.* $\frac{1}{2}$.

5. What is the interest of 1000*l.* for 2 years $\frac{3}{4}$, at 4 per cent. per annum? Ans. 110*l.*

6. What is the interest of $74 68*c.* for 3$\frac{1}{2}$ years at 7 per cent. per annum? Ans. $18 29*c.* 6*m.*

7. What is the amount of $324 45*c.* for 5$\frac{3}{4}$ years at 7 per cent. per annum? Ans. $455 4*c.* 1*m.*

OF BROKAGE.

Q. What is Brokage?

A. It is an allowance made to persons called brokers, at a certain rate per cent. finding customers, and selling to them the goods of other men, whether strangers or natives.

Q. How do you find the brokage of any sum?

A. Divide the given sum by 100, and take parts from the quotient with the rate per cent.

EXAMPLES.

8. *What is the* brokage of 700l. 14s. 6d. at 4s. per cent.? *Ans. 1l. 8s. 0d.* $\frac{1}{4}$.

l.	*s.*	*d.*			*l.*	*s.*	*d.*
7	00	14	6	4 | ½	7	0	1½
	20						
	—				1	8	0¼
0	14						
	12						
	—						
	74						
	4						
	—						
2	96						

). What may a broker demand for brokage, when he sells ›ds to the value of 500*l.* 10*s.* 7*d.* and I allow him 7*s.* per ıt. ? Ans. 1*l.* 15*s.* 0*d.* ¼

10. Suppose I employ a broker, who sells goods to the ıue of 909*l.* 14*s.* 10*d.* what is the brokage at 6*s.* 6*d.* per nt? Answer, 2*l.* 19*s.* 1*d.* ½.

11. *What is the brokage of $659 80*c.* at 73 *cents* per nt. ? Answer, $4 81 6.

12. What is the brokage of $537 28*c.* at 91 *cents* per nt. ? Answer, $4 88 9.

* Multiply by the number of cents brokage, and cut off four ures to the right; the remaining figures on the left will be the swer in cents. This follows from a principle in Decimals.

Note. If the brokerage should be 1*l.* or more per cent. the op-ation will be the same with that in factors allowances.

Case 3.

Q. How is the interest of any sum found, when the rate r cent. is ¼, ½, or ¾, more than the pounds given in the id rate ?

A. Multiply the principal by the pounds, in the rate per nt. as before; and let the parts for ¼, ½, or ¾, be taken m the principal, and added to that product; then proceed :ording to case 1 or 2.

EXAMPLES.

1. What is the interest of 400*l.* for 2 years, at 5½, per nt. per annum ? Answer, 44*l.*

2. What is the interest of 120*l.* for 1 year, at 4½ per cent. r annum ? Answer, 5*l.* 8*s.*

3. What is the amount of 690*l.* for 3 years, at 4¼ per nt. per annum ? Answer, 777*l.* 19*s.* 6*d.*

4. What is the amount of 120*l.* 10*s.* for 2 years and an f, at 4¾ per cent. per annum ? Ans. 134*l.* 16*s.* 2*d.* ½.

5. What is the interest of 300*l.* for 5 years and 3 quarters, ¼ *per cent. per annum* ? Ans. 64*l.* 13*s.* 9*d.*

Of some marks, used

= Two parallel lines are th
1*lb*. signifies that 12 ounce
+Saint George's cross signi
=6 : i. e. 4 more 2, are e
—A straight line signifies les
i. e. 4 less 2, are equal to 2
×Saint Andrew's cross, d
=8 : i. e. 4 multiplied by
÷ ÷A line between two point
sign of division ; as, 4÷2 =
2, is equal to 2.
)(The reversed parenthesis d
i. e. 4 divided by 2, is equal
$\frac{4}{2}\frac{6}{3}$ Numbers placed in a fractio
note division ; the lower b
number the dividend.
:: Four points, set in the mi
them to be proportioned to o
as 2 : 4 :: 8 : 16 ; that is, as 2

N. B. Some masters, instead of points, u
but it is wrong to do so: for the two points
so between the third and the fourth, show th
in the same proportion. And whereas four
terms, they serve to disjoin them, and sho
fourth terms, are not in the same direct pro
mentioned.

MONEY. *L.* Librae, Pounds.
D. Denarii, Pence.

$\overline{2+3}\times 5=25$, signifies that the
by 5, is equal
$\overline{3-2}\times 5=5$, signifies that the
multiplied by 5.

✓ Prefixt to any number, suppo
that number is required. Som
rationality, and signifies that
number can never be truly fou

^{2}✓ Prefixt to any number, suppo
that number is required. Som
rationality, and signifies that
number can never be truly fou

$3aa+3a$, Signifies 3 times the squ
$3aae+3eea+eee$, Signifies 3 time
plied by *e*; more
multiplied by *a*; a
the cube root.

1. As the principal,
   Is to the interest for the whole time:
   So is 100*l.*
   To its interest for the same time.

Divide the interest last found by the time, and the quo- will be the rate per cent.

EXAMPLES.

At what rate of interest per cent. will 500*l.* amount to in 9 years time? Ans. 5 per cent.

At what rate of interest per cent. will 620*l.* amount to 12*s.* in 7 years? Ans. 4 per cent.

At what rate of interest per cent. will 420*l.* amount to 16*s.* in 8 years? Ans. 3 per cent.

At what rate of interest per cent. will $ 720 amount to 8 60*c.* in 5 years? Ans. $ 6 62*c.*+per cent.

At what rate of interest per cent. will 359*l.* amount to . in 8 years? Ans. 5*l.* 17*s.* 8*d.*$\frac{1}{4}$+per cent.

Case 7.

How is the time found when the principal, amount and per cent. are given?

As the interest of the principal for 1 year at the given rate
   Is to one year:
   So is the whole interest,
   To the time required.

EXAMPLES.

In what time will 500*l.* amount to 725*l.* at 5 per cent. annum? Ans. 9 years.

In what time will 620*l.* amount to 793*l.* 12*s.* at 4 per . per annum? Ans. 7 years.

In what time will 420*l.* amount to 520*l.* 16*s.* at 3 per . per annum? Ans. 8 years.

In what time will 750*l.* amount to 990*l.* at 7 per cent. annum? Ans. 4 *yr.* 208 $\frac{6}{73}$ *days.*

In what time will $ 328 amount to $ 645 at 7 per cent. annum? Ans. 13 *yr.* 291$\frac{255}{292}$ *days.*

How are the questions in the foregoing cases proved?

Cases 1, 5, 6, and 7, do exactly prove each other by ring the questions: yet all of them except case 5, and 1st, 2d, 5th, 6th, and 7th questions in case 1, and the 6th, and 8th, in case 2, may as truly be answered by the ible Rule of Three, of which more hereafter.

ote 1. The 1st, 2d, 5th, 6th and 7th questions in case 1, *the 6th, 7th and 8th, in case 2, are to be proved by the Sin- Rule of Three.*

2. Case 5th cannot be answered by the Double Rule of because the principal is not known in the question, and fore there can be no deduction of it from the amount, t the interest, which must first be done.

OF SIMPLE INTEREST FOR DAYS.

Q. How do you find the interest for any number of

A. Multiply the pence of the principal by the days, the rate of interest for a dividend, and 365 by 100 for sor, the quotient will be the answer in pence.

Q. How are the following questions proved?

A. As 365 days
Are to the interest of a given sum for a year:
So is the time proposed,
To the interest required,

EXAMPLES.

1. What is the interest of 120*l.* for 126 days, at cent. per annum? Ans. 1*l.* 13*s.* 1*d.* 2*qrs.* $\frac{252}{365}$.

2. What is the interest of 126*l.* for 145 days, at cent. per annum? Ans. 3*l.* 0*s.* 0*d.* 3*qrs.* $\frac{217}{365}$.

3. What is the interest of 100*l.* from June 1, 1 March 9, 1776, which is leap year, at 5 per cent. per Ans. 3*l.* 17*s.* 6*d.* 1*qr.* $\frac{325}{366}$.

4. What is the interest of 200*l.* from August 14, cember 19 following, at 6 per cent. per annum? Ans. 1*d.* 3*qrs.* $\frac{325}{365}$.

5. What is the interest of 10*l.* for 25 days, at 5 pe per annum? Ans. 8*d.* $\frac{80}{365}$.

6. What is the interest of 40*l.* for 40 days, at 4 pe per annum? Ans. 3*s.* 6*d.* $\frac{30}{365}$.

7. What is the interest of $84 for 63 days, at 7 pe per annum? Ans. 1$ 01 $\frac{170}{365}$C.

8. What is the amount of $247 39*c.* for 138 day per cent. per annum? Ans. $253 93 $\frac{26874}{36500}$C.

See more of Simple Interest in Decimals.

OF COMPOUND INTEREST

Q. WHAT is Compound Interest?

A. Compound Interest is that which arises from an cipal and its interest put together, as the interest st comes due; and for that reason it is called interest u terest, or compound interest.

Q. Is it lawful to let out money at compound interest

A. No; yet in purchasing of annuities or pensi *leases in reversion*, it is very usual to allow compo

to the purchaser, for his ready money; and therefore it very necessary to understand it.

Q. How do you find the compound interest of any given n for any number of years?

A. 1. Find the amount of the given sum by simple inter-, for the first year, which is the principal for the second ır, then find the amount of that principal for the second ır and that is the principal for the third year; and so on any number of years given.

2. Subtract the given sum from the last amount, and the nainder is the compound interest required.

EXAMPLES.

1. What sum will 450*l.* amount to in 3 years, at 5 per nt. per annum, compound interest? Ans. 520*l.* 18*s.* 7*d.*$\frac{1}{2}$.

2. What will 400*l.* amount to in 4 years, at 6 per cent. per nnum, compound interest? Ans. 504*l.* 19*s.* 9*d.*$\frac{3}{4}$.

3. What will 480*l.* amount to in 6 years, at 5 per cent. per nnum, compound interest? Ans. 643*l.* 4*s.* 10*d.*$\frac{1}{2}$.

4. What will 500*l.* amount to in 4 years, at $4\frac{1}{4}$ per cent. r annum, compound interest? Ans. 590*l.* 11*s.* 5*d.*$\frac{1}{2}$.

5. What is the compound interest of 400*l.* 10*s.* at $3\frac{1}{2}$ per nt. per annum, for 3 years? Ans. 43*l.* 10*s.* 9*d.*$\frac{1}{2}$.

6. What is the amount of $ 78 43*c.* for 5 years, at 7 per nt. per annum, compound interest? Ans. $ 109 99*c.* 7*m.*

Note. See more of Compound Interest in Decimals.

OF REBATE OR DISCOUNT.

Q. What is Rebate or Discount?

A. Rebate or Discount is when a sum of money due at any e to come, is satisfied by paying so much present money, being put out to interest, would amount to the given sum the same space of time.

Q. How is the operation performed?

A. 1. As 12 months;
Are to the rate per cent:
So is the time proposed:
To a fourth number.

2. Add that fourth number to 100*l.*

3. As that sum:
Is to the fourth number:
So is the given sum:

To the Rebate.

4. Subtract the Rebate from the given sum, and the remainder is the present worth; or thus,

3. As that sum:
Is to 100*l*.:
So is the given sum:
To the present payment.

4. Subtract the present payment from the given sum, and the remainder is the Rebate.

Q. How do you prove questions in Rebate?

A. Find the amount of the present payment at the time and rate per cent. given, and that will be equal to the given sum.

EXAMPLES.

1. What is the Rebate of 795*l*. 11*s*. 2*d*. for 11 months, at 5 per cent.? Ans. 41*l*. 9*s*. 5*d*. $3qrs.\frac{15}{23}\frac{72}{92}$.

2. What is the present worth of 161*l*. 10*s*. for 19 months at 5 per cent.? Ans. 149*l*. 13*s*. 0*d*.$\frac{1}{2}$.

3. Sold goods for 795*l*. 11*s*. 2*d*. to be paid 4 months hence, what is the present worth, at $3\frac{1}{2}$ per cent.? Ans. 76[illegible] 7*s*. 8*d*.

4. What is the present worth of 4000*l*. payable in 9 months at $4\frac{3}{4}$ per cent.? Ans. 3862*l*. 8*s*. 0*d*.$\frac{1}{2}$.

5. How much ready money for a note of 18*l*. due 15 months hence, at 5 per cent.? Ans, 16*l*. 18*s*. 9*d*. $\frac{3}{4}qrs.\frac{9}{17}$.

6. Suppose 810*l*. were to be paid 3 months hence, allowing 5 per cent. discount, what must be paid in hand? Ans. 800*l*.

7. If a legacy of 1000*l*. is left me July 24, 1776, to be paid on the Christmas day following: what must I receive when I allow 6 per cent. for present payment? Ans. 975*l* 3*s*. 1*d*.

8. Being obliged by bond bearing date August 29, 1807 to pay next midsummer* (which is leap year) 326*l*. what must I pay down, if they allow discount after the rate of 5 per cent.? Ans. 305*l*. 16*s*. 6*d*.$\frac{1}{2}$.

9. Sold goods for 312*l*. to be paid at two three months (that is, half at three months, and the other half at three months, after that) what must be discounted for the present payment at 5 per cent.? Ans. 5*l*. 14*s*. 7*d*.

10. Sold goods for 300*l*. to be paid at three two months (that is, one third at two months, one third at 4 months, and

**June 24th.*—In questions of this nature, Dilworth includes the *days on which* the transaction commenced and ended. Ed.

e third at 6 months) what must be discounted for present yment at 4 per cent.? Ans. 3*l.* 18*s.* 9*d.*

11. What is the present worth of 100*l.* at 5 per cent. payle at two four months? Ans. 97*l.* 11*s.* 4*d.*

12. I would know the present worth of 150*l.* payable at ee four months, at 5 per cent. discount? Ans. 145*l.* 3*s.* 8*d.*¼.

13. What is the present worth of 200*l.* at 4 per cent. paye as follows, viz 100*l.* at two months; 50*l.* at 3 months; 50*l.* at 5 months? Ans. 198*l.* 0*s.* 5*d.*¼.

4. What is the present worth of $164 75*c.* due 6 months ce, discount at 7 per cent.? Ans. $159 17$\frac{3}{103}$*c.*

OF EQUATION OF PAYMENTS,

THE COMMON WAY.

Q. What is Equation of payments?

A. When several sums of money, to be paid at different es, are reduced to one mean time for the payment of the ole, without loss to debtor or creditor, this is called equan of payments.

Q. Wherein may the debtor or creditor be said to suffer s, when the debt is paid?

A. When one mean time is assigned for the payment of whole debt, and the money is not paid till some time afwards: then the creditor suffers loss by laying not only out the principal, or sum due, but also the interest of that sum the time of forbearance, at 3, 4, or more per cent. as they ll agree. Likewise, if the money be paid before it is due, n the debtor suffers loss by allowing so much per cent. agreement, for the time of prompt payment.

2. The loss to either party may be in reducing the several es of payment to one, which is not the true equated time; l then if the payment be made after the true time, the ditor suffers loss, because he receives no interest for it; if time agreed on be before the true time, then the debtor fers loss, because he receives no interest for his early payat.

Q. How is the operation wrought?

A. Multiply each payment by its time, and divide the sum all the products by the whole debt, the quotient is the *uated payment.*

EXAMPLES.

1. A owns B 100*l*. whereof 50*l*. is to be paid at 2 and 50*l*. at 4 months ; but they agree to reduce them payment, when must the whole be paid ? Ans. 3 m

2. A merchant hath owing to him 300*l*. to be paid lows : 50*l*. at 2 months, 100*l*. at 5 months, and the r months ; and it is agreed to make one payment of the I demand when that time must be ? Ans. 6 months.

3. F owes to H 1000*l*. whereof 200*l*. is to be paid 400*l*. at 5 months, and the rest at 10 months but the to make one payment of the whole ; I demand the time ? Ans. 6 months.

4. K is indebted to L a certain sum, which is to charged at 4 several payments, that is, $\frac{1}{4}$ at 2 months months, $\frac{1}{4}$ at 6 months, and $\frac{1}{4}$ at 8 months ; but they ing to make one payment of the whole, the equated therefore demanded ? Ans. 5 months.

5. H bought of X a quantity of goods upon ti which H was to pay $\frac{1}{3}$ of the debt every 3 months whole should be discharged ; but they afterwards a pay the whole at one equated time ; the time of forb therefore is demanded ? Ans. 6 months.

6. W owes Z a sum of money, which is to be paid sent, $\frac{1}{4}$ at 4 months, and the rest at 8 months, what equated time for the whole ? Ans. 3 months.

7. P owes Q 420*l*. which will be due 6 months hen P is willing to pay him 60*l*. now, provided he can h rest forborn a longer time. It is agreed on ; the time bearance therefore is required ? Ans. 7 months.

Note. This question is in reverse proportion. See this rule decimals.

OF BARTER.

Q. What is Barter ?

A. Barter is the exchanging of one commodity other, and informs merchants so to proportion their ties, as that neither may sustain loss.

Q. How do you prove questions in Barter ?

A. By changing the order of them.

EXAMPLES.

1. How much sugar, at 9*d*. per *lb*. must be given i *for 6C. $\frac{1}{2}$ of tobacco*, at 14d. per lb. ? Ans. 10C. 3qr

2. What quantity of tea, at 10*s.* per *lb.* must be given in arter for 1*C.* of chocolate, at 4*s.* per *lb.* ? Ans. 44*lb.* 12*oz.* $\frac{3}{10}$.

3. How much rice, at 28*s.* per *cwt.* must be bartered for 5*C.* $\frac{1}{2}$ of raisins, at 5*d.* per *lb.* ? Ans 5*C.* 3*qrs.* 9*lb.* $\frac{11}{330}$.

4. A and B bartered ; A had 5*C.* of sugar, at 6*d.* per *lb.* hich he gave to B for a quantity of cinnamon, at 10*s.* 6*d.* er *lb.* I demand how much cinnamon B gave A ? Ans. 6*lb.* 4*oz.*

5. B delivered 3 hhds. of brandy, at 6*s.* 8*d.* per gallon, to C or 126 yards of cloth : what was the cloth per yd. ? Ans. 10*s.*

6. A and B bartered : A had 12*C.* of sugar, worth 4*d.* per *b.* for which B gave him 1*C.* $\frac{3}{4}$ of cinnamon ; I demand how rated his cinnamon per *lb.* ? Ans. 27*d.* 1*qr.* $\frac{1}{196}$.

7. A hath linen cloth, worth 20*d.* an ell, ready money ; but n barter he would have 2*s.* B hath broadcloth, worth 14*s.* 6*d.* per yard, ready money ; at what price ought the broadcloth to be rated in barter ? Ans. 17*s.* 4*d.* 3*qrs.* $\frac{4}{10}$ per yard.

8. A and B bartered : A had 41 *cwt.* of hops, at 30*s.* per *C.* for which B gave him 20*l.* in money, and the rest in prunes, at 5*d.* per *lb.* I demand how many prunes B gave A, besides the 20*l.* ? Ans. 17*C.* 3*qrs.* 4*lb.*

9. C hath candles, at 6*s.* per dozen, ready money ; but in arter he will have 6*s.* 6*d.* per dozen ; D hath cotton, at 9*d.* er *lb.* ready money ; I demand what price the cotton must e at in barter ; also how much cotton must be bartered for 00 dozen of candles ? Ans. the cotton is 9*d.* 3*qrs.* per *lb.* barter, and 7*C.* 0*qrs.* 16*lb.* of cotton must be given for 100 zen of candles.

OF LOSS AND GAIN.

Q. What is Loss and Gain ?

A. Loss and Gain is a rule which teaches merchants what ey shall gain or lose in the sale of their goods, having the ice that they bought them for, and the price for which they e to be sold both known.

Q. How are the following questions proved ?

A. Let them be varied.

EXAMPLES.

1. Bought 18*C.* of cheese, at 28*s.* per *C.* which I sell out ain at 3*d.* $\frac{1}{2}$ *per lb.* what is the profit of the whole ? Ans. 4*s.*

2. If I buy deals at 20*d.* a piece, and sell them 17*d.* what shall I lose by 120 dozen? Ans. 18*l.*

3. Hats bought at 4*s.* a piece, and sold again a what is the profit in laying out 100*l.*? Ans. 18*l.* 15

4. Bought 19 fother of lead, at 14*s.* per *C.* what by the whole, sold at 4*d.* per *lb.*? Ans. 432*l.* 5*s.*

5. Bought 60 reams of paper, at 15*s*, per ream the loss in the whole quantity, at 4 per cent.? Ans

6. Bought 7 tons of wine, at 17*l.* per *hhd.* whi again at 1*s.* per pint; I demand the whole gain; gain per cent.? Ans. 229*l.* 12*s.* whole gain; and 8*d.* 1*qr.* $\frac{144}{175}$, the gain per cent.

7. If I sell 500 deals at 15*d.* a piece, and 9*l.* per c what do I lose in the whole quantity? Ans. 3*l.* 1*s.* 9

8. Bought 3 oxen, for 24*l.* 10*s.* which I sell aga per stone; what ought the oxen to weigh together, and offal being the only clear gain? Ans. 245 ston

9. A draper bought 100 yards of broad cloth, for gave 56*l.* I desire to know how he must sell it per gain 19*l.* in the whole? Ans. 15*s.* per yard.

10. A draper bought 100 yards of broad cloth fo demand how he must sell it per yard, to gain 15*l.* out 100*l.*? Ans. 12*s.* 10*d.* 2*qrs.* $\frac{24}{100}$.

OF FELLOWSHIP.

Q. How many sorts of Fellowship are there?

A. Two: Single and Compound.

OF SINGLE FELLOWSHIP.

Q. WHAT is Single Fellowship?

A. Single Fellowship is when the stocks of eacl continue for an equal term of time.

Q. What is the rule?

A. As the sum of the several stocks,
Is to the total gain or loss:
So is each man's share in stock,
To his share of the gain or loss.

Q. How is this rule proved?

A. Add all the shares together, and the sum will to the given gain or loss.

Note. This way of proving Fellowship will not hol *ways, for if* an error should be committed in the be

ork, and carried on through the whole operation, yet the will prove, though each man's share of the gain or loss as- him by that operation, be either more or less than his true

The most exact method, then, that I would propose, something more tedious, is to change the order of the on, and put each man's share of the gain or loss in the of his stock first laid out, and make the sum of the stocks in the place of the whole gain or loss, and then it will be

As the total gain or loss
Is to the sum of the several stocks :
So is each man's share of the gain or loss
To his particular share in stock.

What else doth this rule belong to besides Fellowship ? By it the estate of a bankrupt may be divided among his ors : also legacies may be adjusted, when there is a defi- of assets or effects.

EXAMPLES.

A and B where sharers in a parcel of merchandise, in the se of which A laid out 3*l.* and B 7*l.* and the commodity sold, they find their clear gain amounts to 25*s.* what part ust each man have ? Answer, A must have 7*s.* 6*d.* and B 6*d.*

A, B, and C, trading together, gained 120*l.* which is to be l according to each man's stock ; A put in 140*l.* B 300*l.* 160*l.* what is each man's share ? Answer, A 28*l.* B 60*l.* *l.*

Three merchants trading to Virginia, lost goods to the of 800*l.* Now if A's stock was 1200*l.* B's 4800*l.* and 000*l.* what sum did each man lose ? Answer, A lost 120*l.* *l.* C. 200*l.*

Three merchants traded together, and they put into one on stock 1000*l.* each man, and gained 600*l.* how much each man have ? Answer, 200*l.* each man.

A, B, and C, trading to Guinea with 480*l.* 680*l.* and 840*l.* ears time did gain 1010*l.* how much is each man's share gain ? Ans. A 242*l.* 8*s.* B 343*l.* 8*s.* C 424*l.* 4*s.*

A, B, and C, freighted a ship from the Canaries to Eng- with 108 tons of wine, of which A had 48 ; B 36 ; C 24 : r reason of bad weather, they were obliged to cast 45 verboard ; how much must each man sustain by the loss ? A 20 tons, B 15 tons, C 10 tons.

A merchant is indebted to S 70*l.* to T 400*l.* to V 140*l.* *d.* but upon his decease, his estate is found to be worth no than 409*l.* 14*s.* how must it be divided among his credi-

Ans. S must have 46*l.* 19*s.* 3*d.* 3 *qrs.* $\frac{141752}{148556}$.
T - - 268 7 7 1 $\frac{77258}{148556}$.
V - - 94 7 0 2 $\frac{79196}{148556}$.

8. If the money and effects of a bankrupt amount to 1 14*s.* 6*d.* and he is indebted to A 742*l.* 12*s.* to B 641*l.* 8*d.* and to C 937*l.* 13*s.* 9*d.* how must it be divided a them?

Ans. A must have 438*l.* 8*s.* 4*d.* 1*qr.* $\frac{39}{56}$
B - - - 379 0 3 3 $\frac{15}{56}$
C - - - 583 5 9 3 $\frac{19}{56}$

OF COMPOUND FELLOWSHIP.

Q. What is Compound Fellowship?

A. Compound Fellowship is when the stocks contin unequal term of time.

Q. What is the rule?

A. 1. Multiply each man's stock and time together.
2. Add the several products thence arising togeth
3. As the sum of those products,
Is to the whole gain or loss:
So is each product,
To its share of the gain or loss.

Q. How is this rule proved?

A. As in Single Fellowship.

EXAMPLES.

1. Three merchants traded together: A put in 120 9 months; B 100*l.* for 16 months; and C 100*l.* fo months: and they gained 100*l.* how must it be divided

Ans. A must have 26*l.* 9*s.* 4*d.* 3*qrs.*
B - - - 39 4 3 3
C - - - 34 6 3 1

2. Three merchants join in trade: A put in 400*l.* months; B 630*l.* for 5 months; and C 120*l.* for 12 mo but by misfortunes lost goods to the value of 500l. must each man sustain of the loss?

Ans. A must lose 213*l.* 5*s.* 4*d.* 3*qrs.*
B - - - 201 8 5 0
C - - - 85 6 1 3

3. A, B, and C hold a pasture in common, for which pay 20*l.* per annum. In this pasture A had 40 oxen f days; B had 36 oxen for 50 days, and C had 50 oxen f days, I demand what part every one of these tenants ought to pay of the 20*l.*

Ans. A ought to pay 6*l.* 10*s.* 2*d.* 1*qr.*
B - - - 3 17 1 0
C - - - 9 12 8 2

OF EXCHANGE.

Q. WHAT is Exchange?
A. Exchange is the giving the money, weight, or measure of e country for the like value in bills, money, weight, or mea-re of another country.
Q. What is the course of Exchange?
A. It is the value of money agreed on among merchants.
Q. Is the course of Exchange always the same?
A. No—the course of Exchange rises or falls almost every ay, according as money is plenty or scarce; or according to he time allowed for payment of the money in Exchange; and hen the value is said to be above or under par.
Q. What is the par of Exchange?
A. It is the intrinsic value of any foreign money compared with sterling money.
Q. What is the agio?
A. It is a term used in some countries abroad, especially in Italy, but never in England, and signifies the difference between he value of bank-notes or bank-money and current-money in uch places; that is, it is the difference between the best money sed in the terms of Exchange, and the worst used in payment or goods.
Q. What is meant by bank notes or bank-money?
A. Bank-notes are obtained from foreign bankers, for mo-ey lodged in their banks, which money is called bank-mo-ey.
Q. What is current money?
A. It is such as passes from hand to hand, in the receiving nd paying such sums as are due from one man to another; com-nonly called running cash.
Q. What is usance?
A. It is a certain time allowed for the payment of bills of Ex-hange; but different according to the usage or custom of the lace where the bill is made or compared with the distance of hat place on which the bill is drawn; that is, the nearer the lace on which the bill is drawn, is to the place where it was rawn, the time is the shorter: but the further those places are rom each other, the length of the time allowed for the payment f that bill, from the date of it, is the greater.

Note. Bills are payable five ways, viz.
1. At *sight*.

2. At so many days after sight.

3. At usance, or a certain length of time agreed on be the two places.

4. At double usance, which is double the time agreed tween the two places.

5. Marts or fairs, which is to be understood at some certai accounted for fairs in the same places where the bills are payable.

Q. What are the days of grace?

A. In London it is customary to allow 3 days to th mentioned in the bill, which are called days of grace, last day of which (if it be not on Sunday, but if it is o day) the bill must be demanded, and if not then paid, m immediately protested.

Note. In some places they allow a larger number of grace than they do at London—and in others none at all.

Q. How are questions in Exchange proved?

A. By changing the order of them.

Case 1.

Q. What places does London exchange with in doll pieces of eight of Mexico?

A. With Madrid and Cadiz, in Spain, and with Genc Leghorn, in Italy.

Q. How do they keep their accounts in Spain?

A. In rials and marvedies.

Note. 372 Marvedies make 1 Rial.

8 Rials 1 Piece of eight.

Q. What is the par of exchange between London and S

A. The par of the money between London and Spain 1900 rials are exactly equal to 51*l.* sterling—conseque rial is worth 6*d.* 1*qr.* $\frac{73}{95}$.

Note 1. Spain gives to London 1 dollar or peice of eig an uncertain number of pence sterling.

2. In Spain they allow 14 days of grace.

Q. How do they keep their accounts in Italy?

A. In livres, sols and deniers; some few citizens exce

Note 1. 12 Deniers make 1 Sol.

20 Sols 1 Livre.

5 Livres 1 Piece of eight at Genoa.

6 Livres 1 Piece of eight at Leghorn.

2. The usance of Genoa to London is 3 months after d

3. At Genoa they allow 30 days of grace.

EXAMPLES.

1. What is the amount of 63*l.* sterling, in pieces of ei 56*d.* per piece? Ans. 270 pieces of eight.

2. A factor has sold goods at Cadiz, for 1468 pieces of *at 4s. 6d. 2qrs.* per piece; how much sterling is the sum *333l. 7s. 2d.*

A BILL OF EXCHANGE, VIZ. LEGHORN ON LONDON.

ghorn, July 31, 1781, *for* 786 *pieces of Eight, of Mexico, at* 55*d. sterling per piece of Eight, at* 3 *months.*

Three months after date, pay this my first of Exchange, to r. James Le Morte, or order, seven hundred and eighty-six ces of Eight, at Mexico, for the value received of himself, at d. sterling per piece, and place it to accompt, as per advice am

Mr. William Mayhew, Your humble servant,
Merchant in London. JAMES DOUGLASS.

How much money must be received in England for this bill ? s. 180*l.* 2*s.* 6*d.*

Case 2.

Q. What place does London exchange with in ducats ?
A. With Venice in Italy.
Note. 6 Solidi make 1 Gross—24 Grosses —— 1 Ducat.
Q. What is the par of Exchange between London and Vece ?
A. One hundred Livres are worth 3 pounds sterling.
Q. How many sorts of ducats are there at Venice ?
A. Two sorts, viz. ducats, banco, or bank-ducats, which are ually given in Exchange ; and ducats picoli, or current-duts, which are usually bargained for and paid in the purchase goods and merchandize, and are 20 per cent. worse than the nk ducats.

Note 1. The par of the ducat banco, is 52 pence sterling—d the par of the ducat picoli is 40 pence sterling.

2. The usance of Venice to London and back again, is three nths, or 90 days after date—Two usance is that time ubled.

EXAMPLES.

1. If 100 livres are worth 3*l.* sterling, what is 1 livre worth ? nswer, 7*d.* $\frac{1}{5}$ sterling.
2. There are 2000 ducats at 4*s.* 4*d.* each, remitted to Lonn, to be paid in pounds sterling, what is the amount ? Ans. 3*l.* 6*s.* 8*d.*
3. A bill of 100*l.* sterling, is remitted to Venice, to be paid ducats, at 4*s.* 4*d.* each ; what is the amount ? Answer, 461 ducats.
4. A traveller would exchange 233*l.* 16*s.* 8*d.* sterling, for enice ducats at 4*s.* 9*d.* per ducat ; how many must he have ? *nswer,* 984 $\frac{2}{7}$ ducats.

A BILL OF EXCHANGE, VIZ. VENICE ON LONDON.

Venice, August 17th, 1781, for 4000 ducats banco, at 54d. sterling per ducat, at usance.

At usance pay this my first bill of Exchange, to Mr. Abraham Jennings, or order, four thousands ducats, at fifty-four pence farthing sterling per ducat; value received, and place it to the account of

To Samuel Jones, Esq. Your humble servant,
Merchant in London. WILLIAM SHERSTON.

I demand the value of this bill, in sterling money? Ans. 904*l.* 3*s.* 4*d.*

ANOTHER, VIZ. LONDON ON VENICE.

London, September 14, 1781, for 904l. 3s. 4d. sterling, to be paid at Venice, in ducats, at 54d. ¼ sterling per ducat banco, at usance.

At usance, pay this my second bill of Exchange, my first not paid, to Mr. Samuel Dobbins, or order, nine hundred and four pounds, three shillings and four pence sterling, in ducats, at fifty four pence farthing per ducat, value in myself, and place it to account, as per advice from

To Mr. James Torrianno, Your humble servant,
Merchant at Venice. MICHAEL TASSIO.

What is the value of this bill, in ducats banco? Answer, 4000 ducats.

Case 3.

Q. What places does London exchange with for French crowns?

A. With Paris, Lyons, Rouen, &c. in France.

Q. How do they keep their accounts in France?

A. In livres, sols and deniers.

Note 1. 12 Deniers make - - - - 1 Sol.
20 Sols ——— - - - - 1 Livre.
3 Livres——— - - - - 1 Crown.

2. The livre is imaginary.

3. By an order of Lewis XV. their money is brought to the English standard, for the benefit of trade.

Q. What is the par of Exchange between London and France?

A. One livre is worth 18*d.* sterling: and one crown is worth 4*s.* 6*d.* sterling.

Note 1. In France they allow 10 days of grace: but when bills are drawn at sight, they are payable the same day.

2. *The usance* between France and London is one month, *consisting of* 30 days.

EXAMPLES.

A bill of 200*l.* is remitted to Paris, by a merchant in London; what is the value in French crowns at 4*s.* 6*d.* each? Answer, 888 $\frac{4}{9}$ crowns.

There are 800 French crowns, at 4*s.* 6*d.* each remitted to London, by a merchant in Paris; What is the value in pounds sterling? Ans. 180*l.* sterling.

A BILL OF EXCHANGE, VIZ. PARIS ON LONDON.

Paris, September 17, 1781, *for* 1000 *crowns, at* 4*s.* 2*d. at* 2 *usance.*

At double usance, pay this my second bill of exchange, my first not paid, to Mr. James Jackson, or order, the sum of one thousand crowns, at four shillings and two pence per crown, and be received, and place it to account, as per advice of

Mr. Simeon Surepay, Your humble servant,
London. DANIEL ABBOT.

What is the value of this bill, in sterling money? Answer, 183*l.* 6*s.* 8*d.*

Case 4.

Q. What place does London exchange with for mill-reas?

A. With Oporto and Lisbon, &c. in Portugal; and with the Island of Madeira.

Q. How do they keep their accounts in Portugal?

A. In reas.

Note 1. 1000 reas, make 1 mill-rea.

2. They separate the reas from the mill-reas, by some particular mark: thus 687○496, that is, 687 mill-reas, and 496 reas, which is the same with 687496 reas.

3. Very near 14 reas, or $13\frac{1}{3}$ reas make 1 penny English

Q. What is the par of exchange between London and Portugal?

A. One mill-rea is worth 5*s.* 7*d.* $\frac{1}{2}$ which appears thus:

800 Reas (or 8 testoon piece)	are =	4*s.*	6*d.*
200 Reas (or fourth part)	are =	1	$1\frac{1}{2}$
1000		5	$7\frac{1}{2}$

Note. The usance between London and Portugal is 2 months, 60 days after date.

EXAMPLES.

1. If a bill is drawn from Lisbon of 1432 mill-reas, at 6*s.* 8*d.* per piece—how much English money is that bill? Answer, 477*l.* 6*s.* 6*d.*

2. If a bill be drawn from London of 1333*l.* 6*s.* 8*d.* sterling, how much is it at Lisbon in mill-reas, at 6*s.* 8*d.* each? Ans. 4000 mill-reas.

A BILL OF EXCHANGE, VIZ. LISBON ON LONDON.

Lisbon, October 14, 1781, *for* 4761O 764, *at 5s. 8d. at us*

At usance pay this my first bill of exchange to Mr. H Sozoman, or order, four thousand seven hundred and sixty mill reas, seven hundred and sixty-four reas, at five shi and eight pence sterling per mill-rea, value received ; and it to account of

To Mr. John Joliffe, Your humble servant
Merchant in London. JOHN MIN

What is the value of this bill in sterling money ? 1349*l.* 3*s.* 3*d.* 3$\frac{808}{1000}$*qrs.*

Case 5.

Q. What place does London exchange with for ducat crowns or ecues ?

A. With Florence in Italy.

Q. How do they keep their accounts in Florence ?

A. In ecues, sols and deniers pecoli or currant.

Note. 12 Deniers make 1 Sol.

20 Sols - 1 Ecue, Crown or Ducatoon.

Q. What is the par of exchange between Londo Florence.

A. One ecue, crown or ducatoon is worth 60*d.* sterl

Note. The usance between Florence and London, is 3 m or 90 days after date.

EXAMPLES.

1. A bill of 120 ducatoons is remitted from Florenc 53*d.* each, what is the value in pounds sterling ? An 26*l.* 10*s.*

2. A bill of 220*l.* 16*s.* 8*d.* is drawn from London ; is the value at Florence in ducatoons, or ecues, at 5 each ? Answer, 990 $\frac{7}{10}$ ecues.

A BILL OF EXCHANGE, VIZ. FLORENCE ON LONDON.

Florence, October 19, 1781, *for* 1876 *ecues, at* 63*d. sterlin ecue, at usance.*

At usance pay this my third bill of exchange, my fir second not paid, Mr. Jonathan Formento, or order thousand eight hundred seventy-six ecues, at 63*d.* st per ecue, value received, and place it to account of

To Mr. John Jameson, Your humble servant
Merchant in London. MICHAEL TASSI

What is the value of this bill in sterling money ? 492*l.* 9*s.*

Case 6.

Q. What place does London exchange with for flori

A. With Frankfort in Germany.

Q. How do they keeb their accompts in Frankfort?

A. In goulds, cruitzers and deniers, or fennings.

Note. 1 Fenning, or 4 Deniers make 1 Cruitzer.
60 Cruitzers, - - - 1 Gould or Guilder.

Q. What is the par of exchange between London and Frankfort?

A. Twenty florins are equal to 3*l.* sterling.

Note. When they exchange or negociate bills for London, Holland or Flanders, the bills are paid in goulds of 56 cruitzers — and for France, Hamburg and Italy, in goulds of 60 cruitzers— and sometimes in rix-dollars, at 4*s.* 6*d.* sterling at so much per cent. profit or loss.

EXAMPLES.

1. If 20 florins are equal to 3*l.* sterling, what is the worth of 1 florin? Ans. 3*s.* sterling.

2. If 1000*l.* sterling be remitted to Frankfort, what is the value in florins, at 39*d.* per piece? Ans. 6153$\frac{3}{39}$.

3. If 100 florins, at 40$d\frac{1}{2}$ each, be remitted from Frankfort to London, what is the value in pounds sterling? Ans 16*l.* 17*s.* 6*d.*

A BILL OF EXCHANGE, VIZ. LONDON ON FRANKFORT.

London, September 12, 1781, *for* 763*l.* 10*s. sterling, to be paid in florins, at* 41*d. sterling each, at usonce.*

At usance, pay this my second bill of exchange, my first not paid, to Mr. Jacobus Sanderson, or order, seven hundred sixty-three pounds, ten shillings sterling, in florins, at 41*d.* sterling per florin, value received, and place it to accompt, as per advice from

To Mr. William Maron, Merchant, in Frankfort.

Your humble servant,
JAMES JOHNSON.

What is the value of this bill in florins? Ans. 4469 $\frac{4}{11}$ florins.

Case 7.

Q. What places does London exchange with by the pound flemish or pound sterling?

A. With Antwerp, Brussels, Amsterdam, Rotterdam, and all parts of the Spanish and United Provinces. Also, with Hamburg in Germany.

Q. How do they keep their accounts in these places?

A. Some in pounds, shillings, and pence, as in England; and others, in guilders, stivers, and pennings.

Note 1. 16 Pennings make 1 Stiver.
20 Stivers - 1 Guilder—Also,
6 Stivers - 1 Shilling.
6 Guilders - 1 Pound Flemish.

2. The par of exchange between London and Holland is, that 1*l. sterling* are equal to 100 Florins.

3. A florin is worth 3*s*. 2*d*. $\frac{1}{2}$ Flemish.

4. The prices of the exchange at London, Hamburg, sterdam, are said to have a very great influence upo rest of Europe.

Q. What is the par of exchange between London twerp.

A. Sixteen pounds flemish are equal to nine pou ling: so that 1*l*. flemish is equal to 11*s*. and 3*d*. and 1*l*. sterling is equal to 35*s*. 6*d*. $\frac{1}{2}$ flemish.

EXAMPLES.

1. Being desirous to remit to my correspondent don, the sum of 2000*l*. 12*s*. 6*d*. flemish, to dispos cording to my order, exchange at 34*s*. 6*d*. flemish pe sterling; how much money sterling shall I be credi in the city of London aforesaid? Answer 1159*l*. 3*qrs*. $\frac{1}{4}\frac{2}{1}\frac{8}{4}$.

2. My correspondent in England gives me notice has disbursed in merchandize, upon my account, th 1000*l*. sterling; what sum must I answer for that in the course of exchange being at 33*s*. 4*d* flemish, for on sterling? Ans. 1666*l*. 13*s*. 4*d*. Flemish.

Note. When the course of exchange is at 33*s*. 4*d*. Fle one pound sterling, then to bring Flemish money into money, multiply the Flemish money by 3, and divide duct by 5, the quotient will give the answer in pounds and the contrary.

3. My correspondent in Rotterdam sends me word has disbursed upon my account, the sum of 3060 guil 15 stivers; what sum must I answer for that at Lon course of exchange being at 37*s*. 9*d*. Flemish per pou ling? Ans. 270*l*. 5*s*. 3*d*. 2*qrs*. $\frac{1}{4}\frac{3}{5}\frac{2}{3}$.

Note. A Stiver is 2*d*. Flemish, and a Guilder 40*d*.

4. A merchant delivered at London 120*l*. sterling ceive 147*l*. Flemish in Amsterdam; how much was l at in Flemish money? Ans. 1*l*. 4*s*. 6*d*.

5. If one florin is worth 3*s*. 2*d*. $\frac{1}{2}$ Flemish, and 10 are equal to 9*l*. sterling; how much is the real wor sterling in Flemish money? Ans. 35*s*. 6*d*. $\frac{8}{9}$.

1*fl*. : 3*s*. 2*d*. $\frac{1}{2}$ :: 100*fl*. : 16*l*. Flem.

9 : 16 :: 1 : 35*s*. 6*d*. $\frac{8}{9}$ Flem.

Of reducing the current money of Holland into Bank-mo the contrary.

EXAMPLES.

1. *Being in* Holland, I have 1000 guilders current *which I would* turn into bank-money, the agio b

per cent. how much is it? Ans. 952 guilders $\frac{40}{105}$.

G. Cur. G. B. G. Cur. G. B.
105 : 100 :: 1000 : 952 $\frac{40}{105}$

y correspondent in Amsterdam having wrote me that he had by him of mine 2763 guilders, 15 stivers, cy, I have directed him to turn the same into bank-, the agio being (as I am informed) 5 guilders $\frac{1}{2}$ per I demand how much bank-money it will make? Ans. uilders, 13$\frac{77}{211}$ st. bank-money.

G. Cur. G. B. G. Cur. S. G. B. S.
105 $\frac{1}{2}$: 100 :: 2763 15 : 2619 13 $\frac{77}{211}$.

Holland is indebted to London 7681 guilders, current , and would know how much sterling it will amount change at 35*s.* 6*d.* banco per pound sterling, agio at 5 nt. how much is it? Ans. 686*l.* 17*s.* 6*d.* $\frac{60}{125}$ sterling.

G. C. G. B°. G. C. G. B°. St. Pen.
105 : 100 :: 7681 : 7315 4 12 $\frac{240}{105}$.

l. l. st. G. B°. St. P.
6 : 1 :: 7315 4 12 : 686*l.* 17*s.* 6*d.* 1*qr.*

Amsterdam remits to London, 1090 guilders, 17$\frac{1}{2}$ sti- at 33*s.* 8*d.* banco per pound sterling: what will this ance amount to at London in sterling money? Ans. 0*s.* 1*d.* 3*qrs.* $\frac{53}{164}$ sterling.

e. The above money is supposed to be reduced into bank r already. *s. d. l. St. G. St. B°. l. s. d. qrs.*
33 8 : 1 : 1090 17$\frac{1}{2}$: 108 0 1 3$\frac{53}{164}$.

Of the sale of Gold in Holland.

EXAMPLES.

e. All gold is bought and sold at Amsterdam by weight: , 355 guineas current per mark of that weight.

A merchant in London sends over to his correspondent sterdam, 1000 moidores, valued at 27*s.* sterling each; harges on shipping came to 5*l.* 19*s.* 6*d.* When they to the place consigned, and were weighed, they amount- 14209 guilders, 14 stivers currency, all charges there cted. I demand what was their value in English money, ow much the London merchant gained or lost by his ores, admitting the agio to be 5 guilder per cent. and ourse of exchange 33*s.* 6*d.* B°. Flemish per pound ster- Ans. 12*l.* 15*s.* 4*d.* loss.

1000*Ms*+5*l.* 19*s.* 6*d.*=1355*l.* 19*s.* 6*d.*

G. G. G. St. G. St.
100 : 5 :: 14209 ,, 14 : 710 9

	Gu.	St.	Gu.	St.	Gu.	St.
3.	14209	,,	14—710	,,	9=13499	,, 5

	£.	d.	£.	G.	St.	£.	s.	d.
4.	33	6	: 1 ::	13499	, 5 :	1343	4	2

5. 1355*l.* 19*s.* 6*d.*—1343*l.* 4*s.* 2*d.*=12*l.* 15*s* 4

2. A BILL OF EXCHANGE, VIZ. LONDON ON ROTTERDAM

London, September 14, 1781, *for* 436*l.* 17*s. sterling, a* 6*d. Flemish per pound sterling, at usance.*

At usance, pay this my first of exchange, to Jacob Hoove, or order, four hundred thirty-six pounds, seve shillings sterling, value received of William Johnson, and place it to accompt, as per advice from

To Mr. James Juliers, Your humble servant,
Merchant Rotterdam. THOMAS CARTWRI(

What is the value of this bill in Flemish money?

75*3l.* 11*s.* 3*d.* 3*qrs.* $\frac{1}{2}\frac{7}{8}$.

Also in guilders and stivers? Ans. 4521*guild.* 7*st.*

s.	*d.*
34	6
12	
414	

l.	*s.*
436	17
	414
1747	8
4368	10
174740	0

4|0)18085|5 (4521 Ans.
15

Gu.	St.
18	7

3. ANOTHER, VIZ. ROTTERDAM ON LONDON.

Rotterdam, September 19, 1781, *for* 7693 *guilders* 17 *at* 35*s.* 6*d. Flemish per pound sterling.*

At usance, pay this my second bill of exchange, n not paid, to James Truelove, or order, seven thous hundred ninety-three guilders, seventeen stivers, at 3 Flemish per pound sterling. Value received of Jaq cobson, and place it to accompt, as per advice from

To James Jolles, Esq. Your humble servar
Merchant in London. JOHANNES VAN SH

What is the value of this bill in sterling money?

722*l.* 8*s.* 6*d.* 2*qrs.* $\frac{60}{426}$.

To know how much is gained or lost per cent. on the rai falling of the price of exchange.

EXAMPLES.

1. London draws upon Holland, for any sum of *exchange* at 35*s.* 6*d.* Flemish per pound sterling; in

one month afterwards, London draws on Holland again, hange at 34*s.* 6*d.* I demand what London gains per cent. this negociation? Ans. 2*l.* 17*s.* 11*d.* 2*qrs.*$\frac{2}{4}\frac{2}{4}$.gain.

s. d. s. l. l. s. d.
34 6 : 1 :: 100 : 2 17 11 2*qrs.*$\frac{2}{4}\frac{2}{4}$.

2. London draws upon Amsterdam, exchange at 34*s.* 6*d.* emish per pound sterling; and in five weeks time draws in, the exchange being at 35*s.* 6*d.* How much is lost per t by this transaction? Ans. 2*l.* 17*s.* 11*d.* 2*qrs.* $\frac{2}{4}\frac{2}{4}$.

Note. Hence it is to be observed, that the lower the price of hange is the greater is the gain at London, and the contrary, en it is higher: but the case is just the reverse at Holland.

Case 8.

Q. What places does London exchange with by the pound rling or pounds currency?

A. In all the British dominions in America in the West-ies, and in Ireland.

Q. How do they keep their accounts in these places?

A. As they do in London, that is, in pounds, shillings, nce and farthings; but with this difference, that in London ey call their money sterling, but in all the western dominions ey call it currency.

Q. Why is the money called currency in the western do-inions?

A. Because they have very few coins of any sort circulat-g among them, excepting in the English islands there, and erefore are obliged to deal in what they call paper money.

Note 1. Notes of hand pass currently among the people, and New-England, they are said to be given for so small a sum as shillings. Now as this paper money is subject to many casu-ties, it causes a very great undervaluement of their currency, nd is sometimes, and in some places, at 6 or 700 pounds curren-y, for 100 pounds sterling, or money that is good silver or gold.

2. In all the English islands in the West-Indies, they have so reat a plenty of foreign coins, that their currency is sometimes t no greater discount that 25 per cent. or 125*l.* currency for 100*l.* sterling, and seldom more than 50 per cent.

3. The weights and measures in the British colonies and plantations are the same as those in London, differing only in heir kintals, or hundred weight, their hundred being only 100*lb.* voirdupois, and that at London, 112*lb.*

Q. What foreign coins usually pass in the British colonies nd plantations?

A. These following; the values of which were ascertained *y an act of parliament*, made in the 6th year of Queen Anne,

	weight dwt.	gr.	r. s.	val. d.	Cur. s.	Val. d.	f.
Pieces of eight (old plate of Seville)	17	12	4	6	6	0	0
Ditto of new - - - -	14	0	3	7¼	4	9	2¾
Mexico, ditto - - - -	17	12	4	6	6	0	0
Pillar, ditto - - - -	17	12	4	6¾	6	0	0
Peru, ditto (old plate) -	17	12	4	5	5	10	2¾
Cross Dollars - - - -	18	0	4	4¾	5	10	1⅛
Ducatoons of Flanders - -	20	21	5	6	7	4	0
French crowns, or ecues - -	17	12	4	6	6	0	0
Crusadoes of Portugal - -	11	4	2	10½	3	9	2¾
Three guilder pieces of Holland -	20	7	5	2¼	6	10	3¾
Old rix dollars of the empire -	18	10	4	6	6	0	0

Note 1. Pieces of the same weight and not of the same value may be presumed to be occasioned by the difference of fineness.

2. To remedy the inconveniences which were caused by the different rates at which pieces of the same species were current, it was ordered by proclamation, and confirmed by the aforementioned act of parliament, that after the first day of January, 1704, no Pillar, Mexico, or Seville piece of eight, though of full weight as above, shall be received nor paid at above six shillings a piece, and the halves, quarters, and other lesser pieces, in proportion. And the said act enjoins, that if any one shall receive or pay any of the above pieces, for any more than is above specified, such person shall forfeit ten pounds.

EXAMPLES.

1. A merchant in New-England stands indebted to his correspondent in London, in 4960*l.* 17*s.* 6*d.* currency; what sum must he answer for that at London aforesaid, when the currency is at 300 per cent.? Ans. 1653*l.* 12*s.* 6*d.* sterling.

2. My correspondent in Georgia stands indebted to me for merchandize, in the sum of 120*l.* 6*s.* 9*d.* ½ sterling; how much is that in their currency at 500 per cent. Ans. 601*l.* 13*s.* 11*d.* ½ currency.

3. Trading to Jamaica, my employer there owes me 176*l.* 12*s.* 8*d.* sterling, how much is that in their country at 25 per cent.? Ans. 220*l.* 15*s.* 10*d.* currency.

4. I have lately purchased in Ireland, effects to the value of 400*l.* 17*s.* 9*d.* of that place; what sum must I answer for that at London, exchange at 10 per cent? Ans. 364*l.* 8*s.* 10*d.* 1*qr.* $\frac{5}{11}$.

5. My correspondent at London, draws upon me for 364*l.* 8*s.* 10*d.* ½ sterling, what sum must I answer for that at Dublin, *exchange* at 8⅓ per cent.? Ans. 395*l.* 8*s.* 5*d.* $\frac{61}{200}$.

Case 9.

Q. What places does London exchange with for the crown or rix dollar?

A. With Geneva and Switzerland.

Q. How do they keep their accompts in Geneva?

A. In livres, sols and deniers.

Note 1. 12 Deniers make 1 Sol.
20 Sols · 1 Livre.
3 Livres · 1 Rix dollar.

2. The par is, that 1 rix dollar is equal to 4*s.* 6*d.* sterling; but in exchange it goes for 50*d.* to 60*d.* sterling.

EXAMPLES.

1. London draws upon Geneva for 796*l.* 10*s.* 6*d.* sterling; what sum does that amount to in rix dollars, at 53*d.* per dollar? Ans. 3606 $\frac{4}{53}$ rix dollars.

2. A merchant in Geneva draws upon his correspondent at London for 1960 livres, exchange at 56*d.* per rix dollar; how much sterling must be paid at London to answer that bill? Ans. 152*l.* 8*s.* 10*d.*$\frac{1}{2}$.

$\frac{1960}{3}$=653$\frac{1}{3}$ 1 : 56 :: 653$\frac{1}{3}$: 152*l.* 8*s.* 10*d.*$\frac{1}{2}$+

A BILL OF EXCHANGE, VIZ. LONDON ON GENEVA.

London, October 19, 1781, *for* 376*l.* 11*s.* 8*d. sterling, to be paid in rix dollars, at* 58*d. sterling each at usance.*

At usance pay this my only bill of exchange, to Mr. Janson Gramonville, or order, three hundred seventy-six pounds, eleven shillings and eight pence, sterling, in rix dollars, at 58*d.* sterling per rix dollar, value received, and place it to the accompt of

To Mr. Abraham Sculhausen, Your humble servt.
Merchant, in Geneva. JACOBUS SCHOMBERG.

What is the value of this bill in rix dollars? Answer, 155$\frac{8}{11}$ rix dollars.

Case 10.

Q. What particular piece of money does London exchange with Denmark for?

A. For rix dollars; one being valued at about 4*s.* 6*d.* sterling.

Q. How do they keep their accounts in Denmark?

A. In marks and shillings.

Note 1. 16 Shillings make 1 Mark.
6 Marks - 1 Rix Dollar.

2. The rix dollar in exchange goes for 45*d.* to 58*d.* sterling.

EXAMPLES.

1. London draws on Copenhagen in Denmark, for 184*l.* 16*s.* 7*d.* sterling; what sum must be answered for that in rix dollars at 50*d.* each? Ans. 887$\frac{9}{50}$. rix dollars.

My correspondent in London stands indebted to me according to *my books*, in the sum of 1000 rix dollars, wh

sum must he answer for that at London aforesaid, when the rix dollar by way of exchange is valued at 58*d.*$\frac{1}{2}$? Ans. 243*l.* 15*s.*

3. A merchant in London draws upon his correspondent in Copenhagen, for 400*l.* sterling, but will give no more for a rix dollar than 55*d.* sterling, that being the price of exchange; how many rix dollars must he receive, and what is his whole loss and the loss per cent. they being above par? Ans. 1745$\frac{4}{5}$ rix dollars. The whole loss was 7*l.* 5*s.* 3*d.* and the loss per cent. was 1*l.* 16*s.* 3*d.*$\frac{3}{4}$.

d. *dol.* *l.* *dol.*
55 : 1 :: 400 : 1745$\frac{4}{5}$.
1745$\frac{4}{5}$ at 4*s.* 6*d.*=392*l.* 14*s.* 9*d.* at par.
400*l.*—392*l.* 14*s.* 9*d.*=7*l.* 5*s.* 3*d.* loss.
$\frac{7l.\ 5s.\ 3d.}{4}$=1*l.* 16*s.* 3*d.* $\frac{3}{4}$ loss per cent.

Case 11.

Q. What places does London exchange with for the copper dollar?

A. With Stockholm in Sweden.

Q. How do they keep their accounts in Stockholm?

A. In rix dollars, copper dollars and runstics.

Note 1. 32 Runstics make 1 Copper Dollar.
6 Copper Dollars 1 Rix Dollar.

2. The par of the rix dollar is equal to about 6*s.* sterling—consequently the par of the copper dollar is equal to 1*s.* sterling, or 20 copper dollars make 1*l.* sterling, though the course of exchange is sometimes to 28 or 30 copper dollars per pound sterling.

3. In England sums of money are paid in the best specie, viz. guineas, by which means 1000*l.* or more, may be put into a small bag, and conveyed away in the pocket—but in Sweden they often pay sums of money in copper, and the merchant is obliged to send wheelbarrows instead of bags to receive it.

EXAMPLES.

1. A merchant in Stockholm draws upon his correspondent in London, for 1184 rix dollars; what sum must he answer for that in London aforesaid, when the course of exchange is at par? Ans. 355*l.* 4*s.*

2. Stockholm draws upon London for 1276 rix dollars, what sum must London answer for that, exchange at 25 copper dollars per pound sterling, and what is gained or lost by the drawer at Stockholm aforesaid? Ans. 306*l.* 4*s.* 9*d.* 2*qrs.*$\frac{1}{5}$ the bill, and the drawer loses 76*l.* 11*s.* 2*d.* 1*qr.*$\frac{3}{5}$.

25 : 1 :: 1276×6 : 306 4 9 2$\frac{1}{5}$ the value of the bill.
25 : 5 :: 7656 : 76 11 2 1$\frac{3}{5}$ loss.

HAVING given several bills of exchange to be reduced into sterling or foreign money, it may not be amiss to give the form how a Bill-Book should be kept, that a merchant may know at sight, what bills he has to pay, and what to receive, and when to pay and receive them.

1. BILLS PAYABLE, *i. e.* SUCH AS YOU HAVE ACCEPTED.

The drawer's name and place of residence.	*Date of the bill.*	*The time of payment.*	*Payable to whom or order.*	*The sum drawn for*	*Price of Exchange.*	*For or by whom accepted, and place of abode.*	*The sum sterling.*	*When due.*	*Paid, or refused acceptance*
Wm. Sherston of Venice.	17 *Aug.*	3 *months.*	*Abra'm Jennings.*	*Ducats* B° 4000	*sterling* 54*d.* $\frac{1}{4}$	*William Denny, Rood Lane.*	*l. s. d.* 904 3 4	15 *Nov.*	*Paid.*

2. BILLS RECEIVABLE, *i. e.* SUCH AS YOU HAVE IN YOUR POSSESSION.

The drawer's name and place of residence.	*Date of the bill.*	*The time of payment.*	*Payable to whom or order.*	*The sum drawn for.*	*Price of Exchange.*	*For or by whom accepted, and place of abode.*	*The sum sterling.*	*When due.*	*Received, or returned protested for non acceptance or non payment.*
Mich. Tassini, Florence.	19 *Oct.*	3 *months.*	*James Edward.*	*Ecues* 1875	*sterling* 43*d.*		*l. s.* 492 8	17 *Jan.*	*Protested for non acceptance.*

Case 12.

Of the comparison of Weights and Measures.

EXAMPLES.

1. If 112*lb.* at London make 99*lb.* at Lisbon, how m at London are equal 1049*lb.* at Lisbon? Ans. 1186*lb.*

2. If 112*lb.* at London make 98*lb.* at Roan, how m at Roan are equal to 1000*lb.* at London? Ans. 875*lb.*

3. If 100 ells English make 108 braces at Venice many ells English are equal to 1000 braces at Venice 925*ells*, 4*qrs.* 2*na.* $\frac{4}{10}$*s.*

4. If 100 ells at London make 145 ells at Vienn many ells at Vienna are equal to 10 ells at London? 14 *ells* $\frac{1}{2}$.

Note. Hence appears the reason of those rules, laid d conjoined proportion, for placing the last number in th ther on the right hand or the left, as the nature of the q requires.

lb. Lis. lb. Lon. lb. Lis.

Ex. 1. 99 : 112 :: 1049

lb. *lb.*

112=99

1049

lb. Lon. lb. R. l

Ex. 2. 112 : 98 ::

lb. *lb.*

112=98

1000

REDUCTION OF THE CURRENCIE THE UNITED STATES, &c.

In New-York and North-Carolina the dollar is said for 8*s.*—In Pennsylvania, New-Jersey, Delaware, and land, for 7*s.* 6*d.*—In New-Hampshire, Massachusetts, l Island, Connecticut, and Virginia, for 6*s.*—In Georg South-Carolina for 4*s.* 8*d.*—And in Great Britain for The latter is called sterling.

Case 1.

The following table contains all the possible cases t occur for reducing any one of the above currencies other. The method of using it is so evident, that any tions were superfluous. The rules are deduced fr principals of Proportion. Where the number to mult divide by, exceeds 12, it will be better to divide it into *thus*, to reduce Pennsylvania to Georgia currency, m *by 4 and* 7, and divide by 5 and 9.

FROM	TO					
	New-York, &c. $1 = 8*s.*	*Pennsylvania, &c.* $1 = 7*s.* 6*d.*	*New England, &c.* $1 = 6*s.*	*Georgia, &c.* $1 = 4*s.* 8*d.*	*Sterling.* $1 = 4*s.* 6*d.*
New-York, &c. $1 = 8*s.*		*Subtract* $\frac{1}{15}$.	*Subtract* $\frac{1}{4}$.	*Multiply by* 7 *and Divide by* 12.	*Subtract* $\frac{1}{4}$ *and from the rem. subtract its* $\frac{1}{4}$.
Pennsylvania, &c. $1 = 7*s.* 6*d.*	*Add* $\frac{1}{15}$		*Subtract* $\frac{1}{3}$.	*Multiply by* 28 *and Divide by* 45.	*Multiply by* 3 *and Divide by* 5.
New England, &c. $1 = 6*s.*	*Add* $\frac{1}{3}$.	*Add* $\frac{1}{4}$.		*Multiply by* 7 *and Divide by* 9.	*Subtract* $\frac{1}{4}$.
Georgia, &c. $1 = 4*s.* 8*d.*	*Multiply by* 12 *and Divide by* 7.	*Multiply by* 45 *and Divide by* 28.	*Multiply by* 9 *and Divide by* 7.		*Multiply by* 28 *and Divide by* 27.
Sterling. $1 = 4*s.* 6*d.*	*Add* $\frac{1}{3}$ *and to the sum add its* $\frac{1}{3}$.	*Multiply by* 5 *and Divide by* 3.	*Add* $\frac{1}{3}$.	*Multiply by* 27 *and Divide by* 28.	

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EXAMPLES.

1. Reduce 32*l.* 12*s.* 6*d.* New-York to Pennsylvania currency. Answer, 30*l.* 11*s.* 8¾*d.*

2. Reduce 32*l.* 12*s.* 6*d.* New-York to New-England currency. Answer, 24*l.* 9*s.* 4½d.

3. Reduce 32*l.* 12*s.* 6*d.* New-York to Georgia currency. Answer, 19*l.* 0*s.* 7½*d.*

4. Reduce 32*l.* 12*s.* 6*d.* New-York currency to sterling. Answer, 18*l.* 7*s.* 0½*d.*

5. Reduce 32*l.* 12*s.* 6*d.* Pennsylvania to New-York currency. Answer, 34*l.* 16*s.* 0*d.*

6. Reduce 32*l.* 12*s.* 6*d.* Pennsylvania to New-England currency. Answer, 26*l.* 2*s.* 0*d.*

7. Rednce 32*l.* 12*s.* 6*d.* Pennsylvania to Georgia currency. Answer, 20*l.* 6*s.* 0*d.*

8. Reduce 32*l.* 12*s.* 6*d.* Pennsylvania currency to sterling. Answer, 19*l.* 11*s.* 6*d.*

9. Reduce 32*l.* 12*s.* 6*d.* New-England to New-York currency. Answer, 43*l.* 10*s.* 0*d.*

10. Reduce 32*l.* 12*s.* 6*d.* New-England to Pennsylvania currency. Answer, 40*l.* 15*s.* 7½*d.*

11. Reduce 32*l.* 12*s.* 6*d.* New-England to Georgia currency. Answer, 25*l.* 7*s.* 6*d.*

12. Reduce 32*l.* 12*s.* 6*d.* New-England currency to sterling. Answer, 24*l.* 9*s.* 4½*d.*

13. Reduce 32*l.* 12*s.* 6*d.* Georgia to New-York currency Answer, 54*l.* 18*s.* 6¾*d.*

14. Reduce 32*l.* 12*s.* 6*d.* Georgia to Pennsylvania currency. Answer, 52*l.* 8*s.* 7¾*d.*

15. Reduce 32*l.* 12*s.* 6*d.* Georgia to New-England currency. Answer, 41*l.* 18*s.* 11½*d.*

16. Reduce 32*l.* 12*s.* 6*d.* Georgia currency to sterling Answer, 33*l.* 16*s.* 8*d.*

17. Reduce 32*l.* 12*s.* 6*d.* sterling to New-York currency Answer, 58*l.*

18. Reduce 32*l.* 12*s.* 6*d* sterling to Pennsylvania currency Answer, 54*l.* 7*s.* 6*d.*

19. Reduce 32*l.* 12*s.* 6*d.* sterling to New-England currency. Answer, 43*l.* 10*s.* 0*d.*

20. Reduce 32*l.* 12*s.* 6*d.* sterling to Georgia currency Answer, 31*l.* 9*s.* 2½*d.* *Case* 2.

Place pence under farthings, shillings under pence, and *pounds under shillings*; divide the farthings, with 3 ciphers *annexed, by* 4, and put the quotient after the pence; di-

ence, together with these quotient figures, by 12, placing new quotient figures after the shillings; in like manner le the shillings, and these figures by 20, placing the last ient figures after the pounds; observing to annex *one* ier to the shillings, if the pence and farthings do not ex- l 1*d.* and *two* to the pounds, if the shillings and pence do exceed 2 ½*d.* or *one* cypher, if they are less than 2*s.* Then,

st. For New-York, &c. currency.

ule. Multiply by 5, and divide by 2. Answer in mills.

d. For Pennsylvania, &c.

ule. Multiply by 8, and divide by 3.

l. For New-England, &c.

ule. Multiply by 10, and divide by 3.

h. For Georgia, &c.

ule. Multiply by 30, and divide by 7.

th. For sterling.

ule. Multiply by 40, and divide by 9.

EXAMPLES.

. Reduce 19*l.* 14*s.* 7*d.* ½. New-York, to Federal money.

. $ 49 32*c.* 5*m.*

. Reduce 74*l.* 1*s.* 7*d.* ¾. Pennsylvania, to Federal money.

. $ 197 55*c.* 2*m.*

. Reduce 23*l* 0*s.* 1*d.* ½. New-England, to Federal money.

. $ 76 68*c.* 3*m.*

. Reduce 63*l.* 17*s.* 0*d.* ¾. Georgia, to Federal money.

. $ 273 65*c.* 5*m.*

. Reduce 13*l.* 13*s.* 3*d.* ½. sterling, to Federal money.

. $ 60 72*c.* 8*m.*

Case 3.

st. For New-York, &c.

ule. Multiply the sum, *in mills*, by 2, divide by 5, and off 3 figures on the right; those on the left will be nds: multiply the 3 remaining figures by 20, and cut off hose on the left will be shillings. In like manner pro- l for pence and farthings.

d. For Pennsylvania, &c.

ule. Multiply the sum, *in mills*, by 3, divide by 8; and ceed as before.

d. For New-England, &c.

ule. Multiply the sum, *in mills*, by 3, divide by 10; and ceed as before.

th. For Georgia, &c.

ule. Multiply the sum, *in mills*, by 7, divide by 30; and *ceed as before.*

6th. For sterling.

Rule. Multiply the sum *in mills*, by 9, divide t
proceed as before.

EXAMPLES.

1. Reduce $73 43*c*. to New-York currency. 7*s*. 5*d*. $\frac{1}{4}$.

2. Reduce $ 95 86*c*. 4*m*. to Pennsylvania curr 35*l*. 18*s*. 11*d*. $\frac{3}{4}$.

3. Reduce $49 to New-England currency. An

4. Reduce $164 78*c*. to Georgia currency. A 11*d*. $\frac{1}{2}$.

5. Reduce $47 58*c*. 8*m*. to sterling. Ans. 10*l*.

OF THE DOUBLE RULE OF T

Q. By what is the Double Rule of Three kno

A. By five terms which are always given in th to find a sixth.

Q. In what proportion is the sixth term to be f

A. If the proportion is direct, the sixth term such proportion to the fourth and fifth, as the thi the first and second; but if the proportion is inv the sixth term must bear such proportion to the fifth, as the first bears to the second and third, or cond bears to the first and third.

Note. It is to be observed here as in the Single Rul that direct proportion is when more requires more, quires less, and inverse proportion is when more re or less requires more.

Q. What do you observe concerning the five gi

A. That the three first terms are a supposition last are a demand.

Q. How must the numbers given in the question

A. By two Single Rules of Three; or otherwi

1. Let the principal cause of loss or gain, inte crease, action or passion, be put in the first place

2. Let that which betokeneth time, distance of the like, be put in the second place; and the rem in the third place.

3. Place the other two terms under their like i *position.*

e blank falls under the third term, multiply the first
d terms for a divisor, and the other three for a divi-

ıe blank falls under the first or second term, multiply
ınd fourth terms for a divisor, and the other three for
l, and the quotient will be the answer.
v are the following questions proved ?
them be varied ; or else work the same questions by
ı rules of three.

EXAMPLES.

men can reap 84 acres of wheat in 12 days, how
ı can reap 100 acres in 5 days ? Ans. 20 men.
qrs. of malt are sufficient for a family of 7 persons
ths ; how many *qrs.* are enough for 46 persons 10
Ans. 115*qrs.*
reapers have 3*l.* 4*s.* for 4 days work ; how much
en have for 16 days work ? Ans. 76*l.* 16*s.*
) bushels of oats be enough for 18 horses 20 days ;
r bushels will serve 60 horses 36 days ? Ans. 60

footman travels 240 miles in 12 days, when the
12 hours long ; how many days may he travel 720
of 16 hours long ? Ans. 27 days.
3*lb.* of bread will be sufficient for 7 men 14 days,
ı bread will serve 21 men 3 days ? Ans. 36*lb.*
)0*l.* in half a year, raise 14*l.* interest ; how much
raise in 5 years ? Ans. 80*l.*
)s. be the hire of 8 men for 3 days ; how many days
ıen work for 15*l.* ? Answer, 12 days.
reapers have 24*s.* for 3 days work, how many men
4*l.* 16*s.* in 16 days. ? Answer, 3 men.
usurer put out 86*l.* to receive interest for the
d when it had continued 8 months, he received
pal and interest 88*l.* 17*s.* 4*d.* ; I demand at what
ent. per annum he received interest ? Answer, 5*l.*

ıat is the interest of 200*l.* for 3 years and $\frac{3}{4}$, at 5
per annum ? Answer, 37*l.* 10*s.*
ıat is the interest of 400*l.* for a week, at 5 per cent.
ı ? Ans. 7*s.* 8*d.* 1*qr.* $1\frac{13}{21}$.
at is the interest of 120*l.* for 126 days, at 4 per
annum ? Answer, 1*l.* 13*s.* 1*d.* 2*qr.* $\frac{11}{365}$.
he rule for working questions in Simple Interest for
4, *is taken* from this rule, as appears from this last

OF CONJOINED PROPORTION.

Q. What is Conjoined Proportion?

A. Conjoined Proportion is when the coins, weights measures of several countries are compared in the question; or it is a linking together of many propositions.

Case 1.

Q. How are questions answered in this case?

A. When it is required to know how many of the first sort coin, weight or measure mentioned in the questions, are equ to a given number of the last; then

1. Place the numbers alternately, beginning at the left h and let the last number stand on the left hand.

2. Multiply the first rank continually for a dividend, and t second for a divisor.

Note. See the note in Comparison of weights and measu p. 98, for the reason of this rule.

Q. How is Conjoined Proportion proved?

A. Make as many single rules of three as the nature of t question requires.

EXAMPLES.

1. If 100*lb*. English make 95*lb*. Flemish, and 19*lb*. Flemish 25*lb*. at Bolonia, how many *lb*. English are equal to 50 at Bolonia? Ans. 40*lb*. English.

2. If 25*lb*. at London be 22*lb*. at Nuremburgh; 88*lb*. Nuremburgh 92*lb*. at Hamburgh; 46*lb*. at Hamburgh 48 at Lyons; how many *lb*. at London are equal to 99*lb*. Lyons? Ans. 100*lb*.

3. If 6 braces at Leghorn make 3 ells English; 5 ells English 9 braces at Venice, how many braces at Leghorn will make 45 braces at Venice? Ans. 50 braces at Leghorn.

4. If 3 ells English make 6 braces at Leghorn, and 150 braces at Leghorn 135 braces at Venice, how many ells English are equal to 27 braces at Venice? Ans. 15 ells English.

Case 2.

Q. How are questions answered in this case?

A. When it is required to know how many of the last sor of coin, weight or measure, mentioned in the question, ar equal to a given number of the first: then,

1. Place the numbers alternately, as in case 1, but let th last number stand on the right hand.

2. Multiply the second rank for a dividend, and the firs for a divisor.

EXAMPLES.

If 10*lb.* at London make 9*lb.* at Amsterdam ; 90*lb.* at Amdam 112*lb.* at Thoulouse ; how many *lb.* at Thoulouse are al to 50*lb.* at London ? Ans. 6*lb.* at Thoulouse.

If 20 braces at Leghorn be equal to 10 vares at Lisbon : vares at Lisbon to 80 braces at Lucca ; how many braces at ca are equal to 100 braces at Leghorn ? Ans. 100 braces at ca.

OF ALLIGATION.

Q. How many kinds of Alligation are there ?

A. Two : Alligation Medial, and Alligation Alternate.

OF ALLIGATION MEDIAL.

Q. What is Alligation Medial ?

A. Alligation Medial, is when the quantities and prices of veral things are given to find the mean price of the mixture mpounded of those things.

Q. What is the rule ?

A. As the whole composition,
Is to its total value :
So is any part of the composition
To its mean price.

Q. How is Alligation Medial proved ?

A. Find the value of the whole mixture at the mean rate ; d if it agrees with the total value of the several quantities their respective rates, the work is right.

EXAMPLES.

1. A farmer mingled 19 bushels of wheat at 6*s.* per bushel, d 40 bushels of rye at 4*s.* per bushel, and 12 bushels of rley at 3*s.* per bushel, together ; I demand what a bushel this mixture is worth ? Ans. 4*s.* 4*d.* 1*qr.* $\frac{4}{11}$.

2. A farmer mingled 20 bushels of oats at 2*s.* per bushel, d 30 bushels of beans at 2*s.* per bushel, and 20 bushels of as, at 3*s.* per bushel, together ; I demand the worth of a shel of this mixture ? Ans. 2*s.* 3*d.* 1*qr.* $\frac{4}{7}$.

3. A vinter mingled 5 gallons of Canary, at 8*s.* per gallon, d 6 gallons of Malaga, at 7*s.* per gallon, and 4 gallons of hite wine, at 6*s.* per gallon, together ; I demand what a llon of this mixture is worth ? Ans. 7*s.* 0*d.* 3*qrs.* $\frac{1}{5}$.

4. A grocer mingled 2*C.* of sugar at 56*s.* per *C.* and 1*C.* 43*s.* per *C.* and 2*C.* at 50*s.* per *C.* together ; I demand e price of 3*C.* of this mixture ? Ans. 7*l.* 13*s.*

5. An alehouse-keeper mixed 3 sorts of ale together, viz. *gallons at 6d.* per gallon, 16 gallons at 7d. per gallon, and

21 gallons at 9*d.* per gallon—I demand what 1 gallon of the mixture is worth? Answer, 7*d.* 2*qrs.* $\frac{3}{4}$.

6. A refiner having 5*lb.* of silver bullion, of 8*oz.* fine, 1[illegible] of 7*oz.* fine, and 15*lb.* of 6*oz.* fine, would melt all together—demand what fineness 1*lb.* of this mass shall be? Ans. 6[illegible] 13*dwts.* 8*gr. fine.*

7. A mint-master hath 3*lb.* weight of gold, of 22 carr[illegible] fine, and 3*lb.* of 20 carrats fine—I demand what fineness [illegible] *oz.* of this mixture will bear? Answer, 21 *carrats fine.*

8. An hostler mixing provender for his horses, would p[illegible] in a quantity of beans at 5*s.* per bushel, with the like qua[illegible]ty of oats, at 3*s.* 6*d.* per bushel—I demand the price of bushel of this mixture? Ans. 4*s.* 3*d.*

9. A malster hath several sorts of malt, viz. one sort at [illegible] 6*d.* another at 4*s.* and another at 3*s.* 6*d.* per bushel; and would mix an equal quantity of each together; I demand t[illegible] price of a bushel of this mixture? Answer, 4*s.*

10. A brewer had several sorts of ale, viz. one sort at 2[illegible] per barrel, another at 25*s.* a third at 30*s.* and a fourth at 3[illegible] per barrel—and he would mix an equal quantity of each to[illegible] gether—I demand the price of a barrel, and also of a gallon of this mixture? Answer, 27*s.* 6*d.* per barrel and 10*d.* 1*qr.* $\frac{1}{31}$ per gallon.

OF ALLIGATION ALTERNATE.

Q. What is Alligation Alternate?

A. Alligation Alternate is, when the rates of several things are given to find such quantity of them as are necessary to make a mixture, which may bear a certain rate propounded.

Q. How are the rates or prices of the given things to be ordered?

A. 1. They must be placed one over the other, and the propounded price of composition against them—thus,

mean rate 7. { 4 Prices 5 of the 6 Simples 8

2. Link the several rates together, in such sort, that one greater than the mean rate may be coupled to another which is less.

3. Take the differences between the mean rate, and the several prices, and place them each against his yoke fellow—and for the rest observe the following cases.

Case 1.

Q. What do you observe in this first case?

A. When the prices of the several things, together with *the mean rate* of the mixture are given, without any quantity

ind how much of each ingredient is required to compose mixture—take the difference between each price, and the an rate, and set them alternately, and they will be the ntities required.

Q. How are the operations in this and the following cases oved?

A. They are all proved by Alligation Medial.

EXAMPLES.

1. How much rye at 4*s.* per bushel, barley at 3*s.* per shel, and oats at 2*s.* per bushel, will make a mixture worth 6*d.* per bushel? Ans. 6 bushels of rye, 6 bushels of rley, and 24 bushels of oats.

2. How many raisins of the Sun at 7*d.* per *lb.* and Malaga isins at 4*d.* per *lb.* may be mixed together for 6*d.* per *lb.*? ns. 2*lb.* of raisins of the Sun, and 1*lb.* of Malaga raisins.

Note. Questions in this rule do frequently admit of an infinite riety of answers, and all in whole numbers, as in the last exmple, where though 2 and 1 do answer the question, yet any ther 2 numbers will as truly do the like, that are in the same roportion.

For 2 . 1 .. { 4 - 2 ; 6 - 3 ; 8 - 4 ; 16 - 8 ; 40 - 20, &c. without end.

3. A grocer would mix three sorts of sugar together, viz. ne sort at 10*d.* per *lb.* another at 7*d.* and another at 6*d.* how uch of each sort must he take, that the whole mixture may e sold for 8*d.* per lb.

Ans. 3lb. at 10*d.* : 2lb. at 7*d.* : and 2lb. at 6*d.* per lb.

4. A malster hath several sorts of malt, viz. one sort at 4*s.* er bushel, another at 3*s.* 6*d.* a third at 3*s.* and a fourth at 2*s.* er bushel, and he is desirous to mix so much of each sort gether, that the whole may be sold at 2*s.* 6*d.* per bushel. demand how much he must take of each sort?

Bush. *s.* B *s. d.* B *s.* B *s.*

Ans. 6 at 4; 6 at 3 6; 6 at 3, and 36 at 2 per bushel.

5. A druggist hath several sorts of tea, viz. one sort at 12*s.* er lb. another at 11*s.* a third at 9*s.* and a fourth at 8*s.* per lb. demand how much of each sort he must mix together, that e whole quantity may be afforded at 10*s.* per lb.

lb. *s.*p. *lb.*

Ans. { 2 at 12 ; 1 at 11 ; 1 at 9 ; 2 at 8

2 Ans.

lb. *s.*p. *lb.*

{ 3 at 12 ; 2 at 11 ; 2 at 9 ; at 8

3 Ans.

lb. *s.*p. *lb.*

{ 1 at 12 ; 2 at 11 ; 2 at 9 ; 1 a[illegible]

4 Ans. { *lb.* *s.p.lb.* 1 at 12, 3 at 11, 3 at 9, 1 at 8 } 5 Ans. { *lb.* *s.p.lb.* 3 at 12, 1 at 11, 3 at 9, 2 at 8 } 6 Ans. { *lb.* *s.p* 2 at 1, 3 at 1, 1 at, 3 at

7 Ans. 3*lb.* of each sort.

Note. These seven answers arise from as many diffe ways of linking the rates of the simples together.

6. How much alloy must I mix with bullion of 10 oz. to abase the same to 8 oz. fine? Ans. to every 8 oz. of lion of 10 oz. fine, put 2 oz. of alloy, and that will abase 8 oz. fine.

Case 2.

OF ALTERNATION PARTIAL.

Q. What do you observe in this second case?

A. When the rates of all the things, the quantity of one of them, and the mean rate of the whole mixture given to find the several quantities of the rest in proportio the quantity given; take the difference between each p and the mean rate, and place them alternately, as in cas Then say,

As the difference of the same name with the quantity gi
Is to the rest of the differences severally;
So is the quantity given,
To the several quantities required.

EXAMPLES.

1. A man being determined to mix 10 bushels of w at 4*s.* per bushel, with rye, at 3*s.* with barley, at 2*s.* and oats, at 1*s.* per bushel; I demand how much rye, barley oats must be mixed with the 10 bushels of wheat, tha whole may be sold at 28*d.* per bushel?

1 Ans. { B. p. 2 2 of rye, 5 0 of barley, 12 2 of oats } 2 Ans. { B. 40 of rye, 50 of barley, 20 of oats }

3 Ans. { B. 8 of rye, 10 of barley, 14 of oats } 4 Ans. { B. 10 of rye, 14 of barley, 14 of oats }

5 Ans. { B. p. 12 2 of rye, 5 0 of barley, 17 2 of oats } 6 Ans. { B. 2 of rye, 14 of barley, 10 of oats }

7 Ans. { B 50 of rye, 70 of barley, 20 of oats }

man being determined to mix 12 bushels of oats, at er bushel, with barley, at 2*s.* 6*d.* with rye, at 3*s.* and heat, at 4*s.* per bushel—I demand how much barley, d wheat must be mixed with the 12 bushels of oats, may bear the price of 22*d.* per bushel? Ans. 1 bushel h sort.

A man being determined to mix 12 bushels of oats, at er bushel, with barley, at 2*s.* 6*d.* with rye, at 3*s.* and heat, at 4*s.* per bushel; I demand how much barley, nd wheat must be mixed with the 12 bushels of oats, e whole may bear the price of 2*s.* 9*d.* per bushel?

B. 60 of barley, 60 of rye, 12 of wheat.	2 Ans.	B. p. 2 $1\frac{9}{13}$ of barley, 2 $1\frac{9}{13}$ of rye, 12 0— of wheat.
B. 10 of barley, 10 of rye, 12 of wheat.	4 Ans.	B. 72 of barley, 72 of rye, 12 of wheat.
B. 2 of barley, 12 of rye, 10 of wheat.	6 Ans.	B. p. 14 $1\frac{8}{13}$ of barley, 2 $1\frac{8}{13}$ of rye, 14 $1\frac{8}{13}$ of wheat.

7 Ans. 12 bushels of each sort.

A man being determined to mix 12 bushels of oats, at er bushel, with barley at 2*s.* 6*d.* with rye, at 3*s.* and heat, at 4*s.* per bushel; I demand how much barley, nd wheat, must be mixed with 12 bushels of oats, that ole quantity may bear the price of 3*s.* 6*d.* per bushel?

Ans. B.
12 of barley,
12 of rye,
84 of wheat.

A man intends to mix 28 bushels of oats, at 18*d.* per , with barley at 2*s.* 6*d.* with rye at 3*s.* and with wheat per bushel; I would know how much barley, rye, and ought to be added to the 28 bushels of oats, that the quantity may be afforded at 2*s.* per bushel? Ans. 4 s of each sort.

A Farmer would mix 27 bushels of peas, at 18*d.* per , with oats, at 28*d.* and with beans at 30*d.* per bushel, e whole quantity may bear the price of 20*d.* per bush- *demand how* much oats and beans must be mixed with *bushels of* peas? Ans. 3 bushels of each sort.

Case 3.

OF ALTERNATION TOTAL.

Q. What do you observe in this third case?

A. When the rates of the several things, the quantity to be compounded, and the mean rate of the whole mixture are given, to find how much of each sort will make up the quantity: place the differences between the several prices, and the mean rate, alternately, as in case 1, then say,

As the sum of the differences,
Is to the whole composition:
So is the difference of each rate,
To the quantity of the same rate.

EXAMPLES.

1. A grocer hath 4 sorts of sugar, viz. at 8*d*. per lb. at 6*d*. at 4*d*. and at 2*d*. per lb. and he would have a composition of an Cwt. worth 5*d*. per lb. I demand how much of each sort he must take?

1 Ans.

lb.		*d*.p.lb.
42	at	8
14	at	6
14	at	4
42	at	2
112		

2 Ans.

lb.		*d*.p.lb.
14	at	8
42	at	6
42	at	4
14	at	2
112		

3 Ans.

lb.	oz.	dr.		*d*.p.lb.
28	0	0	at	8
37	5	5 $\frac{4}{12}$	at	6
9	5	5 $\frac{4}{12}$	at	4
37	5	5 $\frac{4}{12}$	at	2
112	0	0		

4 Ans.

lb.	oz.	dr.		*d*.p.lb.
37	5	5 $\frac{4}{12}$	at	8
9	5	5 $\frac{4}{12}$	at	6
37	5	5 $\frac{4}{12}$	at	4
28	0	0	at	2
112	0	0		

5 Ans.

lb.	oz.	dr.		*d*.p.lb.
11	3	3 $\frac{2}{16}$	at	8
44	12	12 $\frac{8}{16}$	at	6
44	12	12 $\frac{8}{16}$	at	4
11	3	3 $\frac{2}{16}$	at	2
112				

6 Ans.

lb.		*d*.p.lb.
32	at	8
24	at	6
24	at	4
32	at	2
112		

7 Ans. 28*lb*. of each sort.

2. *A vinter* hath 4 sorts of wine, viz. Canary, at 10*s*. per gallon, *Malaga*, at 8*s*. Rhenish, at 6*s*. and Oporto, at 4*s*. and he is minded to make a composition of 60 gallons, worth

llon—I demand how much of each he must have? Ans. lons of Canary, and 5 gallons of each other sort.

A brewer hath 3 sorts of ale, to wit. at 10*d.* at 8*d.* and at r gallon; and he would have a composition of 30 gallons, 7*d.* per gallon—I demand how much of each sort he must

	Gals.	*d.* p. gal.
Ans.	5 at	10
	5 at	8
	20 at	6
	30	

goldsmith hath several sorts of gold, viz. some of 24 car- ıe, some of 22 carrats, and some of 18 carrats fine: and ıld have compounded of these sorts the quantity of 60 oz :arrats fine. I demand how much of each sort he must

	Oz.	
Ans.	12 at	24 carrats fine.
	12 at	22 carrats fine.
	36 at	18 carrats fine.
	60	

A goldsmith hath gold of three sorts, viz. of 22 carrats, of rats, and of 20 carrats fine, and he would mix with these so alloy, as that the quantity of 21 oz. may bear 18 carrats : demand how much of each sort he must take, and how alloy? Ans. 6 oz. of each sort of gold, and 3 oz. of al-

druggist had 3 sorts of drugs, one was worth 4*s.* per lb. a- 5*s.* and another 8*s.* and out of these he made two par- ne was 21lb. at 6*s.* per lb. and the other 35lb. at 7*s.* how much of every sort did he take for each par-

	lb.	*s.* p. lb.	lb.	*s.* p. lb.
Ans.	6 at	4	5 at	4
	6 at	5	5 at	5
	9 at	8	25 at	8
	21 at 6*s.* per lb.		35 at 7*s.* per lb.	

OF POSITION.

Q. What is Position ; or Negative Arithmetic ?
A. It discovers the truth by supposed numbers.
Q. How many kinds of Position are there ?
A. Two ; Single and Double.

OF SINGLE POSITION.

Q. WHAT is Single Position ?
A. It discovers the truth by only one supposed number.
Q. How is that supposed number used ?
A. By working with it, as if it was the true number, in same proportion as the question directs ; and if the result be ther too much or too little, the true number may be found by the following rule, viz.

As the result of the position,
Is to the position :
So is the given number,
To the number required.

Q. How do you prove Position ?
A. Position both Single and Double, is proved by addi the several sums required, or the several parts of the sum r quired together ; and if that sum agrees with the given sum, is right.

EXAMPLES

1. Two men, A and B, having found a bag of money, disp ted who should have it ; A said the half, third and fourth of t money made 130*l.* and if B could tell how much was in it, should have it all, otherwise he should have nothing ; I dema how much was in the bag ? Ans. 120*l.*

2. A, B and C, determined to buy together a certain qua tity of timber, worth 36*l.* agree that B shall pay $\frac{1}{3}$ more th A, and C $\frac{1}{4}$ more than B; I demand how much each man mu pay ? Ans. A. 9*l.* B. 12*l.* C. 15*l.*

3. A person having about him a certain number of crown said if the half, third and fourth of them were added togethe they would make 65 crowns ; I demand how many he had Ans. 60 crowns.

4. A lent B a sum of money, to be paid at four payments when three of them were made. and A came to demand th fourth, B would give him no more, except he would tell hi how much was paid already : A said the first payment was fourth, the second a fifth, and the third a sixth of the sum fir lent, and altogether made 74*l.* I demand the sum lent ? Ans 120*l.*

. One man carrying a bag of money in his hand, another ed him how much was in it ; he answered he could not ; but the third, fourth and fifth of it made 94*l*. How ch was in the bag ? Ans. 120*l*.

. I have delivered to a banker a certain sum of money, receive of him after the rate of 6*l*. per cent. per annum ; l at the end of ten years he paid me 500*l*. for principal and erest together ; I demand the sum delivered to him at it ? Ans. 312*l*. 10*s*.

OF DOUBLE POSITION.

Q. What is Double Position ?

A. It is that which discovers the true number sought, by king use of two supposed numbers.

Q. How are those supposed numbers used ?

A. 1. By working with them as if they were the true numrs in the same proportion as the question directs.

2. The results or errors must be placed against their positions, or supposed numbers, thus,

Pos.	*Er.*
40	28
36	19

3. Multiply them cross-wise.

4. If the errors are alike, i. e. both greater or both less an the given number, take their difference for a divisor, and e difference of the products for a dividend.

5. If the errors are unlike, take their sum for a divisor, and e sum of the products for a dividend ; the quotient thence sing will be the answer.

EXAMPLES.

1. A, B and C, would divide 100*l*. between them, so as t B may have 3*l*. more than A, and C 4*l*, more than B ; emand how much each man must have ? Ans. A 30*l*. B 3*l*. C 37*l*.

2. A man lying at the point of death, said he had in a cerin coffer 100*l*. which he bequeathed to three of his friends er this manner : the first must have a certain portion, the cond must have twice as much as the first, wanting 8*l*. d the third must have three times as much as the first anting 15 *l*. I demand how much each man must have ? ns. the first 20*l*. 10*s*. second 33*l*. third 46*l*, 10*s*.

3. A, B, and C built an house which cost 100*l*. of which A paid a certain sum, B paid 10*l*. more than A, and C paid as much as A and B. I demand each man's share in the harge ? Ans. A 20*l*. B 30*l*. C 50*l*.

4. Three persons discoursed together concerning their ges ; says A, I am 20 years of age ; says B, I am as old as A, *and half C ; and says* C, I am as old as you both ; I de-

mand the age of each person ? Ans. A was 20, B 60, C 80 years of age.

5. A man lying at the point of death; left to his 3 sons all his estate in money, viz. to F half wanting 50*l.* to G one third, and to H the rest, which was 10*l.* less than the share of G. I demand the sum left, and each man's part ? Ans. the sum left was 360*l.* whereof F had 130*l.* G 120*l.* H 110*l.*

6. A certain man having drove his swine to the market, viz. hogs, sows and pigs, received for them all 50*l.* being paid for every hog 18*s.* for every sow 16*s.* for every pig 2*s.* There were as many hogs as sows, and for every sow there were three pigs. I demand how many there were of each sort ? Ans. 25 hogs, 25 sows, 75 pigs.

7. A surly old fellow being demanded the ages of his four children, answered, you may go and look; but if you must needs know, my first son was born just 1 year after I was married to his mother, who after his birth lived 5 years, and then died in child-bed, with my second son; 4 years after that I married again, and within 2 years had my third and fourth sons at a birth: the sum of whose two ages is now equal to that of the eldest. I demand their several ages ? Ans. the first son was 22 years old, the second 17, the third 11, and the fourth 11 years old.

OF COMPARATIVE ARITHMETIC.

Q. What is Comparative Arithmetic ?

A. It is such as answers questions by numbers, having relation one to another.

Q. Wherein does this relation consist ?

A. It consists either in quantity or quality.

Q. What is the relation of numbers in quantity ?

A. It is the respect that one number has to another.

Q. How many are the numbers propounded ?

A. They are always two, the antecedent and the consequent.

Q. In what does relation of numbers in quantity consist ?

A. It consists in the difference, or else in the rate or reason that is found between the terms propounded.

Note. The difference of any two numbers is the remainder *but the* rate or reason is the quotient of the antecedent divided *by the* consequent.

Q. *What* is relation of numbers in quality or progression

A. Progression or proportion is the respect that the reason of numbers have one to another.

Q. How many must the terms be?

A. Three or more, but never less, because less than 3 will not admit of a comparison of reasons or differences.

OF PROGRESSION.

Q. How many kinds of Progression are there?

A. Two: Arithmetical and Geometrical.

OF ARITHMETICAL PROGRESSION.

Q. What is Arithmetical Progression?

A. Arithmetical Progression is, when several numbers have equal differences: as, 1, 2, 3, 4, differ by 1, or 2, 4, 9, differ by 2.

Note 1. If any number of terms differ by Arithmetical Progression, the sum of the two extremes will be equal to the sum of any two means equally distant from the extremes. As in 2, 4, 6, 8, where 2+8 are=4+6=10, and so of any larger number of terms.

2. If the number of terms be odd, the middlemost supplies the place of two terms, as in 1, 2, 3; where 1+3 are=2+2=4.

Case 1.

Q. What do you observe in this first case?

A. When the two extremes, and the number of terms in any series of numbers in Arithmetical Progression are given, and the sum of all the terms is required, then multiply the sum of the two extremes by half the number of terms: or,

Multiply half the sum of the extremes by the whole number of terms, the product is the total of all the terms.

EXAMPLES.

1. How many strokes does the hammer of a clock strike in 12 hours? Answer, 78.

2. A merchant hath sold 100 yards of superfine cloth, viz. the first yard for 1*s.* the 2d for 2*s.* the 3d for 3*s.* &c. I demand how much he received for the said cloth? Ans. 252*l.* 10*s.*

3. Bought 19 yards of shalloon, and gave 1*d.* for the first yard, 3*d.* for the second, 5*d.* for the third, &c. increasing 2*d.* every yard. I demand what I gave for the 19 yards? Answer, 1*l.* 10*s.* 1*d.*

4. A mercer sold 20 yards of silk, at 3*d.* for the first yard, 1*l.* for the 2d. 9*d.* for the 3d. &c. increasing 3*d.* every yard. demand what he sold the 20 yards for? Ans. 2*l.* 12*s.* 6*d.*

5. A butcher bought 100 head of cattle, viz. oxen, and ve for the first ox 1 crown, for the second ox 2 crowns, for

the third ox 3 crowns, &c. I demand what the cattle cost him? Ans. 1262*l.* 10*s.*

6. Admit 100 stones were laid 2 yards distant from each other in a right line, and a basket placed 2 yards from the first stone. I demand how many miles a man shall go in gathering them singly into the basket? Answer, 11 miles, 3 furlongs, 18 yards.

7. A merchant sold 1000 yards of linen, at 2 pins for the 1st yard, 4 for the 2d, and 6 for the 3d, &c. increasing 2 pins for every yard—I demand how much the linen produced, when the pins were afterwards sold at 12 for a farthing? Also, whether the said merchant gained or lost by the sale thereof, and how much, supposing the said linen to have been bought at 6*d.* per yard?

Ans. { The linen produced - - - - 86*l.* 17*s.* 10*d.*
{ The merchant gained - - - 61 17 10

Case 2.

Q. What do you observe in this second case?

A. When the two extremes and the number of terms in any series of numbers in Arithmetical Progression are given, and the common difference of all the terms in that series are required, then,

Divide the difference between the two extremes, by the number of terms, less one; the quotient will be the common difference.

EXAMPLES.

1. There are 21 men, whose ages are equally different from each other in Arithmetical Progression; the youngest is 20 years old, and the eldest is 60. I demand the common difference of their ages, and the age of each man? Ans. the common difference is 2 years—therefore,

Years.
60 is the age of the first man.
60—2=58 is the age of the second ——
58—2=56 is the age of the third ——
56—2=54 is the age of the fourth ——, &c.

2. A debt is to be discharged at 16 several payments in Arithmetical Proportion. The first payment is to be 14*l.* the last 100*l.* what is the whole debt, and what must each payment be? Ans. the whole debt is 912*l.* the common difference is 5*l.* 14*s.* 8*d.*—therefore,

14*l.* 0*s.* 0*d.* 1st payment.
14*l.* 0*s.* 0*d.*+5*l.* 14*s.* 8*d.*=19 14 8 2d ——
19 14 8 +5 14 8 =25 9 4 3d ——
25 9 4 +5 14 8 =31 4 0 4th ——, &c.

3. A man is to travel from York to a certain place in 12 days, and go but 3 miles the first day, increasing every day's journey by an equal excess, so that the last day's journ

ay be 36 miles; what will each day's journey be, and how any miles is the place he goes to distant from York? Ans. e common difference is 3—therefore,

Miles.

3 is the first day's journey.
3+3= 6 is the second
6+3= 9 is the third
9+3=12 is the fourth, &c.
The whole distance is 234 miles.

4. A running footman, on a wager, is to travel from London northward, as follows; that is to say, he is to go 4 miles the first day, and 40 miles the last day, and to go the whole journey in ten days, increasing every day's journey by an equal excess; I demand the number of miles he travelled each day, and the length of the whole journey? Ans. the common difference is 4—therefore,

Miles.

4 is the first day's journey.
4+4= 8 is the second
8+4=12 is the third, &c.
The whole journey is 220 miles.

OF GEOMETRICAL PROGRESSION.

Q. What is Geometrical progression?

A. When any rank or series of numbers increases by one common multiplier, or decreases by one common divisor, those numbers are continued in Geometrical Progression; as 3, 6, 12, 24, increase by the multiplier 2—and 24, 12, 6, 3, decrease by the divisor 2.

Note. 1. If any number of terms be continued in Geometrical Progression, the product of the two extremes will be equal to the product of any two means equally distant from the extremes, as in 3, 6, 12, 24; where 3×24, are$=6\times12=72$; and so of any larger number of terms.

2. If the number of terms be odd, the middlemost supplies the place of two terms; as in 3, 6, 12; where 3×12 are$=6\times6=36$.

3. The common multiplier, and the common divisor, are called Ratios.

Q. How is the sum of any series in Geometrical Progression obtained?

A. 1. When all the terms alone are given, then from the product of the second and last terms, subtract the square of *the first term: that* remainder being divided by the second *term less the first, will* give the sum of all the terms.

2. When the two extremes and the ratio are only given, then multiply the last term into the ratio, and from that product subtract the first term: that remainder divide by the ratio less an unit or 1, the quotient is the sum of all the terms.

Note 1. As the last term in a long series of numbers is very tedious to come at by continual multiplication—it would be necessary for the readier finding it out, to have a series of numbers in Arithmetical Proportion, called indices, beginning with an unit, whose common difference is one. Also, whatsoever number of indices you make choice of, let as many numbers (in such Geometrical Proportion as are given in the question) be placed under them.

Thus { 1, 2, 3, 4, 5, 6, 7, *indices.* [*tion.*
{ 2, 4, 8, 16, 32, 64, 128, *numbers in Geometrical Proportion.*

2. But if the first term in Geometrical Proportion be different from the ratio, the indices must begin with a cypher.

Thus { 0, 1, 2, 3, 4, 5, 6, *indices*
{ 1, 2, 4, 8, 16, 32, 64, *numbers in Geometrical Proportion.*

3. When the indices begin with a cypher, the sum of the indices made choice of must always be one less than the number of terms given in the question, because 1 in the indices stands over the second term, and 2 in the indices stands over the third term, &c.

4. Add any two of these indices together, and that sum will directly correspond with the product of their respective terms.

5. By the help of these indices, and a few of the first terms, in any series of Geometrical Progression, any term whose distance from the first term is assigned, though it were never so far, may speedily be obtained without producing all the terms.

EXAMPLES.

1. A man bought a horse, and by agreement was to give a farthing for the first nail, two for the second, four for the third, &c. there were four shoes, and eight nails in each shoe. I demand what the horse was worth at that rate? Ans. 4473924*l.* 5*s.* 3*d.* 3*qrs.*

2. A merchant sold 15 yards of satin, the first yard for 1*s.* the second for 2*s.* the third for 4*s.* the fourth for 8*s.* &c. I demand the price of the 15 yards? Ans. 1638*l.* 7*s.*

3. A draper sold 20 yards of superfine cloth, the first yard for 3*d.* the second for 9*d.* the third for 27*d.* &c. in triple Proportion, Geometrical. I demand the price of the cloth? Ans. 21792402*l.* 10*s.*

4. A goldsmith sold 1*lb.* of gold, at a farthing for the first ounce, a penny for the second, 4*d.* for the third, &c. in quadruple Proportion Geometrical. I demand what he sold the whole for; also how much he gained by the sale thereof, supposing he gave for it 4*l.* per ounce?

Ans. { *He* sold it for 5825*l.* 8*s.* 5*d.* 1*qr.*
{ *And* gained 5777 8 5 1

5. A crafty servant agreed with a farmer (ignorant in numbers) to serve him 12 years, and to have nothing for his service but the produce of a wheat-corn for the first year; and that product to be sowed for the second year; and so on from year to year, until the end of the said time. I demand the worth of the whole produce, supposing the increase to be but in a tenfold proportion, and sold out at 4*s.* per bushel! Ans. 452112*l.* 4*s.* rejecting remainders.

Note 1. 7680 wheat or barley-corns are supposed to make a pint and 64 pints a bushel.

2. If the first term in any series be either greater or less than the ratio (except unity) then multiply any two terms together, and their product divide by the first term—that quotient will exactly correspond with the sum of their indices.

6. A thresher worked 20 days at a farmer's, and received for the first day's work 4 barley-corns for the second 12 barley corns, for the third 36 barley-corns, and so on in triple proportion geometrical. I demand what the 20 days labour came to, supposing the whole quantity to be sold for 2*s.* 6*d.* per bushel? Ans. 1773*l.* 7*s.* 6*d.* rejecting remainders.

7. A merchant sold 30 yards of fine velvet, trimmed with gold very curiously, at 2 pins for the first yard, 6 pins for the second, 18 pins for the third, &c. in triple proportion geometrical. I demand how much the velvet produced, when the pins were afterwards sold at 100 for a farthing; also whether the said merchant gained or lost by the sale thereof, and how much, supposing the said velvet to have been bought at 50*l.* per yard?

Ans. { The velvet produced 2144699292*l.* 13*s.* 0½*d.*
{ The merchant gained 2144697792 13 0½.

OF PERMUTATION.

Q. What is Permutation?

A. Changing the order of things.

Q. How do you find all the variations any number of things is capable of going through?

A. Multiply all the given terms one into another continually; the last product is the number of changes required.

EXAMPLES.

1. I demand how many changes may be rung upon twelve bells; and also how long they would be in ringing but once over, *supposing* 24 changes might be rung in one minute.

year to contain 365 days, 6 hours? Ans. the number of changes is 479001600, and the time is 37 years, 49 weeks, 2 days, 16 hours.

2. Seven gentlemen who were travelling, met together by chance, at a certain inn upon the road, where they were so well pleased with their host, and each other's company, that in a frolic they offered him 30*l.* to stay at that place so long as they, together with him, could sit every day at dinner in a different order. The host thinking that they could not sit in many different positions, because there were but few of them, and that himself would make no considerable alteration; he being but one, imagined that he should make a good bargain, and readily, for the sake of a good dinner, and better company, entered into an agreement with them, and so made himself the eighth person. I demand how long they staid at the inn, and how many different positions they sat in? Ans. the number of positions were 40320, and the time that they staid was 110 years, 142¼ days; allowing the year to consist of 365 days, 6 hours.

Note. There is one thing in progression, and in varying the order of things, which is well worth our observation; and that is, the power of numbers, which is surprisingly great, and beyond common belief; and is no ways conceivable by a common practitioner, hardly by a very good artist; it being (in appearance) not so much against reason as above it. The first example in Geometrical Progression discovers what a prodigious sum of money a horse sold after that manner would produce, viz. no less than four million, four hundred and seventy-three thousand nine hundred and twenty-four pounds; whereas if the same horse had been sold at the same rate, and but a fourth part of the nails, he would have brought to his owner no more than 5*s.* 3*d.* ¾. The second example in Permutation does likewise discover the impossibility of the innkeeper's performing his promise: and in both, the simplicity of two men, who thinking they have got very good bargains, do instead thereof, find themselves severe sufferers. And although at the first appearance each question seems to produce but a mere trifle; yet upon a mature consideration, there will not be found a man in the kingdom able to purchase the one, or long lived enough to stand to the agreement with the other. Hence observe the great possibility of a man's being imposed on in this way by sharpers, without a careful examination into the affair, before any contract is made.

PART II.

OF VULGAR FRACTIONS.

OF FRACTIONS IN GENERAL.

Q. What is a Fraction?

A. It is a broken number, and signifies the part or parts of whole number.

Q. How many kinds of Fractions are there?

A. Two: Vulgar and Decimal.

OF NOTATION OF VULGAR FRACTIONS.

Q. What is a Vulgar Fraction?

A. Any two numbers placed thus $\frac{7}{4}$, make a Vulgar Fraction.

Q. What is the upper number of such a fraction called?

A. It is called numerator, and is the remainder after Division.

Q. What is the lower number called?

A. It is called denominator, and denotes any whole divided into parts: and is the divisor in division.

Q. How many sorts of Vulgar Fractions are there?

A. Three: Proper, Improper, and Compound.

Q. What is a proper fraction?

A. When the numerator is less than the denominator, as $\frac{3}{4}$.

Q. How far may a proper fraction be expressed?

A. Without end: as $\frac{1}{2}$ may be called $\frac{2}{4}$, or $\frac{3}{6}$, or $\frac{4}{8}$, &c. but the lowest term is $\frac{1}{2}$ always desired.

Q. What is an improper fraction?

A. When the numerator is greater than the denominator, as $\frac{8}{7}$.

Q. What is a compound fraction?

A. It is the fraction of a fraction, as $\frac{1}{2}$ of $\frac{1}{3}$, &c.

OF REDUCTION OF VULGAR FRACTIONS.

Case 1.

Q. How are Vulgar Fractions reduced to a common denominator?

A. 1. Multiply each numerator into all the denominators but its own, for a new numerator.

2. Multiply all the denominators for a common denominator.

EXAMPLES.

1. Reduce $\frac{3}{7}$ and $\frac{4}{5}$ to a common denominator. Facit $\frac{21}{35}$ & $\frac{28}{35}$.
2. Reduce $\frac{7}{8}$, $\frac{9}{16}$ and $\frac{11}{32}$ to a common denominator. Facit $\frac{224}{256}$, $\frac{144}{256}$ and $\frac{88}{256}$.
3. Reduce $\frac{5}{16}$, $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{7}$ to a common denominator. Facit $\frac{280}{560}$, $\frac{140}{560}$, $\frac{280}{560}$ and $\frac{240}{560}$.
4. Reduce $\frac{4}{9}$, $\frac{7}{11}$, $\frac{5}{7}$ and $\frac{1}{2}$ to a common denominator. Facit $\frac{616}{1386}$, $\frac{882}{1386}$, $\frac{1155}{1386}$ and $\frac{693}{1386}$.
5. Reduce $\frac{2}{5}$, $\frac{3}{7}$, $\frac{1}{3}$, and $\frac{4}{9}$ to a common denominator. Facit $\frac{126}{315}$, $\frac{135}{315}$, $\frac{105}{315}$ and $\frac{140}{315}$.
6. Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{5}{8}$ and $\frac{7}{9}$ to a common denominator. Facit $\frac{324}{648}$, $\frac{216}{648}$, $\frac{405}{648}$ and $\frac{504}{648}$.

Case 2.

Q. How do you reduce a Vulgar Fraction to its lowest terms?

A. Find a common measure by dividing the lower term by the upper; and that divisor by the remainder following, till nothing remains; the last divisor is the common measure.

2. Divide both parts of the fraction by the common measure, and the quotients will make the fraction required.

Note 1. If the common measure happens to be 1, the given fraction is already in its lowest terms.

2. When a fraction hath cyphers at the right hand, it may be abbreviated by cutting them off, thus $\frac{7}{5}\frac{0}{0}$.

3. This case will prove case 1.

EXAMPLES.

1. Reduce $\frac{48}{240}$ to its lowest terms. Facit $\frac{1}{5}$.
2. Reduce $\frac{72}{864}$ to its lowest terms. Facit $\frac{1}{12}$.
3. Reduce $\frac{84}{176}$ to its lowest terms. Facit $\frac{21}{44}$.
4. Reduce $\frac{60}{125}$ to its lowest terms. Facit $\frac{12}{25}$.
5. Reduce $\frac{192}{960}$ to its lowest terms. Facit $\frac{1}{5}$.
6. Reduce $\frac{468}{1148}$ to its lowest terms. Facit $\frac{117}{287}$.

Case 3.

Q. What is a mixt number?

A. It is composed of a whole number and a fraction, thus $7\frac{3}{4}$.

Q. How is a mixt number reduced to an improper fraction?

A. 1. Multiply the whole number into the denominator of the fraction.

2. To the product, add the numerator for a new numerator.

3. Let its denominator be the denominator given.

Note. To express a whole number fraction-wise, put 1 for its denominator.

duce $12\frac{4}{7}$ to an improper fraction. Facit $\frac{88}{7}$.
duce $19\frac{2}{8}$ to an improper fraction. Facit $\frac{154}{8}$.
duce $16\frac{19}{106}$ to an improper fraction. Facit $\frac{1715}{106}$.
duce $12\frac{2}{50}$ to an improper fraction. Facit $\frac{602}{50}$.
duce $100\frac{2}{50}$ to an improper fraction. Facit $\frac{5002}{50}$.
duce $79\frac{2}{15}$ to an improper fraction. Facit $\frac{1187}{15}$.

Case 4.

ow is an improper Fraction reduced to its proper

vide the upper term by the lower.
This case and case 3, prove each other.

EXAMPLES.

duce $\frac{889}{17}$ to its proper terms. Facit $12\frac{4}{7}$.
duce $\frac{1407}{17}$ to its proper terms. Facit $8\frac{5}{7}$.
duce $\frac{2345}{65}$ to its proper terms. Facit $2\frac{35}{65}$.
duce $\frac{9861}{177}$ to its proper terms. Facit $56\frac{9}{17}$.
duce $\frac{15}{7}$ to its proper terms. Facit $1\frac{8}{7}$.
duce $\frac{24}{7}$ to its proper terms. Facit $3\frac{3}{7}$.

Case 5.

ow do you reduce a compound fraction to a single

Multiply all the numerators for a new numerator.
ltiply all the denominators for a new denominator.

EXAMPLES.

luce $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{3}{4}$ to a single fraction. Facit $\frac{9}{32}$.
luce $\frac{7}{8}$ of $\frac{4}{5}$ of $\frac{9}{10}$ to a single fraction. Facit $\frac{252}{400}$.
luce $1\frac{2}{14}$ of $\frac{6}{8}$ of $\frac{1}{2}$ to a single fraction. Facit $\frac{60}{168}$.
luce $\frac{6}{8}$ of $\frac{4}{7}$ of $\frac{3}{4}$ to a single fraction. Facit $\frac{72}{224}$.
luce $\frac{3}{5}$ of $\frac{3}{4}$ of $\frac{4}{7}$ to a single fraction. Facit $\frac{36}{140}$.
luce $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{6}{7}$ to a single fraction. Facit $\frac{48}{126}$.

Case 6.

w do you reduce the fraction of one denomination
ction of another, but greater, retaining the same

Reduce the given fraction to a compound fraction by
g it with all the denominations between it, and that
tion, which you would reduce it to.
uce that compound fraction to a single one, by case 5.

EXAMPLES.

luce $\frac{1}{8}$ of a penny to the fraction of a pound.
l.
luce $\frac{1}{2}$ of a farthing to the fraction of a shilling.

3. Reduce $\frac{8}{9}$ of an ounce troy, to the fraction of a po
Facit $\frac{8}{108}lb.$

4. Reduce $\frac{8}{7}$ of a pound avoirdupois to the fraction
Cwt. Facit $\frac{8}{784}Cwt.$

5. Reduce $\frac{9}{13}$ of a pint of wine to the fraction of a
Facit $\frac{9}{6552}hhd.$

Case 7.

Q. How do you reduce the fraction of one denominatio
the fraction of another, but less, retaining the same value?

A. Multiply the given numerator, by the parts of the d
minations between it, and that denomination you would re
the fraction to, for a new numerator, and place it over the g
denominator.

Note. This case and case 6, prove each other.

EXAMPLES.

1. Reduce $\frac{5}{1440}$ of a pound to the fraction of a pe
Facit $\frac{240}{1440}=\frac{5}{6}d.$

2. Reduce $\frac{1}{96}$ of a shilling to the fraction of a farth
Facit $\frac{1}{4}qr.$

3. Reduce $\frac{8}{108}lb.$ troy to the fraction of an oz. Facit $\frac{8}{}$

4. Reduce $\frac{8}{784}$ of an *cwt.* to the fraction of a *lb.* Facit

5. Reduce $\frac{9}{6552}$ of a hhd. of wine to the fraction of a
Facit $\frac{9}{13}$ pint.

Case 8.

Q. How do you reduce vulgar fractions from one den
nation to another of the same value, having the numerato
the required fraction given?

A. As the numerator of the given fraction,
Is to its denominator:
So is the numerator of the intended fraction,
To its denominator.

EXAMPLES.

1. Reduce $\frac{3}{4}$ to a fraction of the same value, whose nu
rator shall be 15. Facit $\frac{15}{20}=\frac{3}{4}$.

2. Reduce $\frac{7}{8}$ to a fraction of the same value, whose nu
rator shall be 42. Facit $\frac{42}{48}$.

3. Reduce $\frac{3}{4}$ to a fraction of the same value, whose nu
rator shall be 34. Facit $45\frac{1}{3}^{34}$.

4. Reduce $\frac{7}{9}$ to a fraction of the same value, whose nu
rator shall be 78. Facit $131\frac{7}{9}^{3}$.

Note. From cases 8 and 9, there arises a new fraction w
may not improperly be called a mixt fraction.

Case 9.

Q. How do you reduce Vulgar Fractions from one denomination to another of the same value, having the denominator of the required fraction given?

A. As the denominator of the given fraction,
Is to the numerator:
So is the denominator of the intended fraction,
To its numerator.

Note. This case and case 8, prove each other.

EXAMPLES.

1. Reduce $\frac{3}{4}$ to a fraction of the same value, whose denominator shall be 20. Facit $\frac{15}{20}=\frac{3}{4}$.

2. Reduce $\frac{7}{8}$ to a fraction of the same value, whose denominator shall 49. Facit $42\frac{7}{8}$.
$\overline{49}$

3. Reduce $\frac{3}{4}$ to a fraction of the same value, whose denominator shall be 46. Facit $34\frac{2}{4}$.
$\overline{46}$

4. Reduce $\frac{4}{5}$ to a fraction of the same value, whose denominator shall be $131\frac{2}{5}$. Facit $131\frac{3}{5}$.
$\overline{73}$

Case 10.

Q. How is a mixed fraction reduced to a single fraction?

A. 1. When the numerator is the integral part: then
(1.) Multiply it by the denominator of the fractional part, and to that product add the numerator of the fractional part, for a new numerator.
(2.) Multiply the denominator of the fraction by the denominator of the fractional part of the numerator, for a new denominator.

Note. This proves case 9.

EXAMPLES.

1. Reduce $42\frac{7}{8}$ to a simple Fraction. Facit $\frac{7}{8}$.
$\overline{49}$

2. Reduce $34\frac{2}{4}$ to a simple fraction. Facit $\frac{3}{4}$.
$\overline{46}$

3. Reduce $17\frac{4}{5}$ to a simple fraction. Facit $\frac{1}{3}\frac{5}{3}\frac{7}{7}$.
$\overline{85}$

2. When the denominator is the integral part: then
(1.) Multiply it by the denominator of the fractional part, and to that product add the numerator of the fractional part, for a new denominator.
(2.) Multiply the numerator of the fraction by the denominator of the fractional part, for a new numerator.

Note. This proves case 8.

EXAMPLES.

1. Reduce $131\frac{3}{5}$ to a simple fraction. Facit $\frac{3}{6}\frac{5}{7}\frac{3}{1}=\frac{5}{2}$.
$\overline{73}$

2. Reduce $\frac{41}{73\frac{1}{4}}$ to a simple fraction. Facit $\frac{164}{293}$.

3. Reduce $\frac{7}{19\frac{3}{4}}$ to a simple fraction. Facit $\frac{28}{79}=\frac{4}{11}$.

Case 11.

Q. How do you find the proper quantity of a fraction in known parts of an integer?

A. Multiply the numerator by the common parts of the integer, and divide by the denominator.

EXAMPLES.

1. Reduce $\frac{5}{6}$ of a pound sterling to its proper quan Facit 13*s*. 4*d*.

2. Reduce $\frac{11}{12}$ of a shilling to its proper quantity. Facit 5*d*.

3. Reduce $\frac{3}{4}$ of 5*l*. 9*s*. to its proper quantity. Facit 13*s*. 5*d*. $\frac{1}{4}$.

4. Reduce $\frac{11}{12}$ of a lb. troy to its proper quantity. Facit

5. Reduce $\frac{1}{4}\frac{3}{5}$ of a ton weight to its proper quantity. F 3C. 0qr. 8lb. 9oz. 13dr. $\frac{4}{5}$.

6. Reduce $\frac{4}{7}$ of a lb. avoirdupois to its proper quan Facit 8oz. 14dr. $\frac{4}{7}$.

7. Reduce $\frac{9}{17}$ of 10C. 1qr. 12lb. to its proper quan Facit 8C. 1qr. 25lb. 1oz. 7dr. $\frac{9}{17}$.

8. Reduce $\frac{4}{5}$ of a mile to its proper quantity. Facit 1125yds. 2ft. 1in. 2b.c. $\frac{4}{5}$.

9. Reduce $\frac{3}{5}$ of a yard to its proper quantity. Fac feet, 8 inches, 1b.c. $\frac{3}{5}$.

10. Reduce $\frac{3}{4}$ of an ell English to its proper quan Facit 1 yard.

11. Reduce $\frac{7}{16}$ of an acre to its proper quantity. F 1 rood, 30 perches.

12. Reduce $\frac{5}{8}$ of a tun of wine to its proper quan Facit 1 hhd. 49 gallons.

13. Reduce $\frac{7}{8}$ of a barrel of beer to its proper quan Facit 31 gallons, $\frac{1}{2}$.

14. Reduce $\frac{3}{4}$ of a chaldron of coals to its proper quan Facit 13 bushels $\frac{1}{2}$.

15. Reduce $\frac{3}{4}$ of a quarter of corn to its proper quan Facit 2 bushels, 1 peck, $\frac{1}{4}$.

16. Reduce $\frac{2}{15}$ of a day natural, to its proper quan Facit 12 hours, 55 minutes, 23 seconds $\frac{1}{15}$.

17. Reduce $\frac{1}{2}$ of a month to its proper quantity. Fa weeks, 1 day, 9 hours, 36 minutes.

18. What is the proper quantity of $\frac{7}{8}$ of a yard of cl *Answer*, 3 quarters, 2 nails.

19. What is the proper quantity of $\frac{2}{3}$ of a hhd. of *Answer*, 12 gallons.

20. What is the proper quantity of $\frac{3}{10}$ of a barrel of ale? Answer, 6 gallons.

Case 12.

Q. How do you reduce any given quantity to the fraction of any greater denomination of the same kind?

A. 1. Reduce the given quantity to the lowest term mentioned for a numerator.

2. Reduce the integral part of the same term for a denominator, and that will be the fraction required.

Note 1. If there be a fraction given with the said quantity let it be put to the numerator of the fraction required.

2. Cases 11 and 12 prove each other.

EXAMPLES.

1. Reduce 13*s.* 4*d.* to the fraction of a pound sterling.—Facit $\frac{2}{3}\frac{0}{0}=\frac{2}{3}l.$

2. Reduce 5*d.* $\frac{1}{12}$ to the fraction of a shilling. Facit $\frac{5}{12}$.

3. What part of 5*l.* 9*s.* is 4*l.* 13*s.* 5*d.* $\frac{1}{4}$. ? Ans. $\frac{4}{5}$.

4. Reduce 9*oz.* troy to the fraction of a *lb.* Facit $\frac{9}{12}=\frac{3}{4}lb.$

5. Reduce 3*C.* 0*qr.* 8*lb.* 9*oz.* 13*dr.* $\frac{4}{16}$ to the fraction of a ton. Facit $\frac{1}{14}$ ton.

6. Reduce 8*oz.* 14*dr.* $\frac{8}{9}$ to the fraction of a *lb.* avoirdupois. Facit $\frac{5}{8}lb.$

7. What part of 10*C.* 1*qr.* 12*lb.* is 8*C.* 1*qr.* 25*lb.* 1*oz.* 7*dr.* $\frac{3}{11}$? Answer, $\frac{9}{11}$.

8. Reduce 4fur. 125yds. 2 feet, 1in. 2b.c. $\frac{1}{4}$ to the fraction of a mile. Facit $\frac{1}{4}$ mile.

9. Reduce 2 feet, 8in. 1b.c. $\frac{2}{10}$ to the fraction of a yard. Facit $\frac{9}{25}$ yard.

10. Reduce 1yd. to the fraction of an ell. Facit $\frac{1}{4}$ ell.

11. Reduce 1 rood 30 poles to the fraction of an acre Facit $\frac{7}{10}$ acre.

12. Reduce 1 hhd. 49gals. of wine to the fraction of a tun. Facit $\frac{1}{8}$ tun.

13. Reduce 31gals. $\frac{1}{2}$ of beer to the fraction of a barrel. Facit $\frac{1}{4}$ barrel.

14. Reduce 13bush. $\frac{1}{2}$ of coals to the fraction of a chaldron. Facit $\frac{3}{8}$ chaldron.

15. Reduce 2bush. 1peck $\frac{1}{4}$ of corn to the fraction of a quarter. Facit $\frac{1}{4}$ quarter.

16. Reduce 12hrs. 55min. 23sec. $\frac{1}{12}$ to the fraction of a day natural. Facit $\frac{7}{12}$ day.

17. Reduce 3w. 1d. 9hrs. 36min. to the fraction of a month. Facit $\frac{1}{4}$ month.

18. Reduce 3qrs. 2na. to the fraction of a yard. Facit

19. Reduce 12 gals. of beer to the fraction o
Facit $\frac{4}{1\,1}$.

20. Reduce 6 gals. of ale to the fraction of a barre
$\frac{3}{1\,6}$ bar.

21. Reduce 13 hours, 30 minutes, to the frac
day. Facit $\frac{9\,1\,3}{1\,4\,4\,0}=\frac{9}{1\,0}$.

OF ADDITION OF VULGAR FRACTION

Q. How are Vulgar Fractions added together?

A. 1. Reduce the given fractions to a common den

2. Add all the numerators together for a new nu
under which subscribe the common denominator.

Note. This rule is proved by Subtraction, when two
only are given.

EXAMPLES.

1. Add $\frac{1}{2}$ and $\frac{1}{4}$ together. - - Facit 1
2. Add $\frac{7}{1\,2}$ and $\frac{1}{2}$ and $\frac{1}{3}$ together - Facit 2
3. Add 19 and $\frac{1}{2}$ of $7\frac{1}{2}$ together - Facit 2
4. Add $\frac{1}{2}$ of $\frac{7}{8}$ and $\frac{2}{3}$ of $\frac{1}{1\,0}$ together - Facit 1
5. Add $\frac{1}{2}$ of 95 and $\frac{1}{7}$ of 14 together Facit 4
6. Add $\frac{2}{3}$ and $17\frac{1}{2}$ together - - Facit 1
7. Add $12\frac{1}{2}$ and $3\frac{3}{4}$ and $4\frac{3}{4}$ together - Facit 2
8. Add $\frac{2}{1\,0}$ of $6\frac{1}{4}$ and $\frac{1}{4}$ of $\frac{1}{2}$ and $7\frac{1}{2}$ together. Faci

Note. In order to find the following facits, the fracti
must be reduced to their proper quantities by Case 1
duction, and then added as in Addition of whole nu

9. Add $\frac{1}{4}$ of a pound to $\frac{3}{4}$ of a shilling. Facit 1
10. Add $\frac{3}{4}$ of a penny to $\frac{1}{2}$ of a pound. Facit 2*s.*
11. Add $\frac{1}{2}$ of a pound troy to $\frac{7}{1\,2}$ of an oz. F
11*dwts.* 16*grs.*
12. Add $\frac{1}{4}$ of a ton to $\frac{2}{1\,0}$ of an *Cwt.* Facit 12*C.*
12*oz* 12*dr.* $\frac{8}{1\,0}$.
13. Add $\frac{3}{4}$ of a mile to $\frac{7}{1\,0}$ of a furlong. Facit 6 f
14. Add $\frac{1}{2}$ of a yard to $\frac{2}{3}$ of a foot. Facit 2 fee
15. Add $\frac{1}{3}$ of a day to $\frac{1}{2}$ of an hour. Facit 8hrs
16. Add $\frac{1}{2}$ of a chal. to $\frac{1}{4}$ of a bush. Facit 16 bush.
17. Add $\frac{1}{3}$ of a week, $\frac{1}{4}$ of a day, and $\frac{1}{2}$ of an
gether. Facit 2 days, 14 hours $\frac{1}{2}$.
18. Add $\frac{2}{3}$ of a yard, $\frac{3}{4}$ of a foot, and $\frac{1}{4}$ of a mile
Facit 1540 yards, 2 feet, 9 inches.

OF SUBTRACTION OF VULGAR FRACTI

Q. How are Vulgar Fractions subtracted?

A. 1. Reduce the given fractions to a common den

. Subtract the lesser number from the greater, and place difference over the common denominator.

. When the lower fraction is greater than the upper, ract the numerator of the lower fraction from the deno- ator, and to that difference add the upper numerator, rying one to the units place of the lower whole number.

ote. This rule is proved by Addition.

EXAMPLES.

. From $\frac{1}{4}\frac{1}{1}$ take $\frac{2}{4}$. - - Facit $\frac{1}{4}\frac{9}{1}$.
. From $\frac{9}{1}\frac{7}{0}$ take $\frac{3}{7}$. - - Facit $\frac{3}{7}\frac{7}{0}$.
. From $96\frac{1}{3}$ take $14\frac{2}{7}$. - - Facit $81\frac{1}{2}\frac{9}{1}$.
. From 96 take $\frac{3}{5}$ - - - Facit $95\frac{2}{5}$.
. From $\frac{1}{3}$ of 76 take $\frac{3}{4}$ of 21 - Facit $9\frac{7}{1}$.
. From $\frac{1}{1}\frac{9}{0}$ take $\frac{1}{4}$ of $\frac{2}{3}$ of $\frac{3}{4}$ - Facit $\frac{1}{2}\frac{2}{0}\frac{5}{4}\frac{6}{0}$.
. From $71\frac{1}{4}$ take $\frac{7}{0}$. - - Facit $70\frac{2}{3}\frac{3}{5}$.
. From $14\frac{1}{4}$ take $\frac{3}{4}$ of 19. - Facit $1\frac{7}{1}$.

ote. In order to find the following facits, the fractions given it be reduced to their proper quantities by case 11, in Reduc- , and then subtracted, as in Subtraction of whole numbers.

. From $\frac{1}{2}$ of a pound take $\frac{3}{4}$ of a shilling. Facit 9*s.* 3*d.*

0. From $\frac{1}{2}$ of a shilling take $\frac{3}{4}$ of a penny. Facit 5*d.* $\frac{1}{4}$.

1. From $\frac{3}{4}$ of an oz. take $\frac{7}{8}$ of a dwt. Facit 11dwts. 3grs.

2. From $\frac{1}{2}$ of a Cwt. take $\frac{7}{1}$ of a pound. Facit 1 qr. 6oz. 10dr. $\frac{8}{1}$.

3. From $\frac{3}{4}$ of a league take $\frac{7}{1}$ of a mile. Facit 1 mile, ir. 16 poles.

4. From 1 ell take $\frac{7}{1}$ of a qr. Facit 1yd. 0qr. 1na. $\frac{3}{1}$.

5. From $\frac{3}{1}$ of a hhd. of beer take 1 gal. Facit 12 gal. $\frac{1}{2}$.

6. From $\frac{1}{3}$ of a chaldron take $\frac{2}{3}$ of a bushel. Facit 17 h. 1 peck $\frac{1}{2}$.

7. From 7 weeks take 9 days $\frac{7}{1}$. Facit 5 weeks, 4 days, ours, 12 minutes.

8. From 4 days, 7 hours $\frac{1}{2}$, take 1 day, $9\frac{3}{1}$ hours. Facit ay, 22 hours $\frac{1}{2}$.

F MULTIPLICATION OF VULGAR FRACTIONS.

Q. How are Vulgar Fractions multiplied?

A. 1. Prepare the given numbers (if need be) by the rules Reduction.

2. Multiply all the given numerators for a new numerator, l all the denominators for a new denominator.

Note. When any number either whole or mixt is multiplied a fraction, *the product* is always less than the multiplicand, *he same proportion* as the multiplying fraction is less than n *unit.*

EXAMPLES.

1. Multiply $\frac{3}{7}$	by $\frac{5}{11}$	Facit $\frac{8}{77}$.
2. Multiply $\frac{4}{5}$	by $\frac{7}{9}$	Facit $\frac{2}{3}\frac{8}{5}$.
3. Multiply $\frac{1}{3}$ of $\frac{4}{5}$	by $\frac{7}{10}$ of $\frac{11}{12}$	Facit $\frac{3}{11}\frac{1}{0}$.
4. Multiply $7\frac{1}{2}$	by $8\frac{1}{3}$	Facit $61\frac{1}{2}$.
5. Multiply $4\frac{1}{2}$	by $\frac{1}{9}$	Facit $\frac{2}{10}$.
6. Multiply 7	by $13\frac{8}{10}$	Facit $12\frac{1}{2}\frac{3}{0}$.
7. Multiply $\frac{1}{2}$ of 7	by $\frac{3}{8}$	Facit $1\frac{9}{12}$.
8. Multiply $\frac{3}{4}$ of 8	by $\frac{7}{8}$ of 5	Facit 21.
9. Multiply $\frac{3}{8}$	by $\frac{4}{5}$ of 11	Facit $2\frac{1}{2}\frac{4}{0}$.
10. Multiply $\frac{1}{4}$ of 91	by $71\frac{1}{2}$	Facit $5205\frac{1}{1}$
11. Multiply $12\frac{3}{5}$	by $\frac{2}{3}$ of 7	Facit $29\frac{1}{3}\frac{4}{0}$.
12. Multiply $7\frac{1}{3}$	by $9\frac{1}{4}$	Facit $69\frac{3}{4}$.

OF DIVISION OF VULGAR FRACTIONS.

Q. How are Vulgar Fractions divided?

A. 1. Prepare the numbers given (if need be) by Rules of Reduction.

2. Multiply the denominator of the divisor into the numerator of the dividend, for a new numerator; and the numerator of the divisor into the denominator of the dividend a new denominator.

Note 1. When the dividend is greater than the divisor quotient will be greater than the dividend: But when the dend is less than the divisor, then the quotient will be less the dividend, and in the same proportion as an unit is gr or less than the dividend fraction.

2. Multiplication and Division prove each other.

EXAMPLES.

1. Divide $\frac{1}{2}\frac{7}{0}$	by $\frac{3}{5}$	Facit $1\frac{1}{6}$
2. Divide $\frac{1}{1}\frac{3}{0}$	by $\frac{7}{9}$	Facit $\frac{1}{1}$
3. Divide $\frac{1}{1}\frac{4}{0}$	by $\frac{7}{10}$	Facit 1_1
4. Divide $1\frac{1}{2}$	by $4\frac{9}{10}$	Facit $\frac{3}{9}$
5. Divide $\frac{7}{8}$	by 4	Facit $\frac{7}{3}$
6. Divide 4	by $\frac{7}{8}$	Facit 4
7. Divide 99	by 108	Facit $\frac{9}{1}$
8. Divide $\frac{1}{4}$ of 19	by $\frac{2}{3}$ of $\frac{3}{4}$	Facit 7_2
9. Divide $\frac{1}{3}$ of $\frac{2}{3}$	by $\frac{2}{3}$ of $\frac{3}{4}$	Facit $\frac{2}{3}$
10. Divide $\frac{2}{3}$ of $\frac{3}{4}$	by $\frac{1}{2}$ of $\frac{2}{3}$	Facit 1
11. Divide $4\frac{5}{9}$	by $\frac{5}{8}$ of 4	Facit 2
12. Divide $\frac{1}{4}$ of 4	by $4\frac{5}{8}$	Facit

E SINGLE RULE OF THREE DIRECT, IN VULGAR FRACTIONS.

ıw is the Rule of Three in Fractions performed?
ıe operation of the Rule of Three in Fractions, both
ıd Double, Vulgar and Decimal, are exactly agree-
ıe principles laid down in the same rules in whole

ıw are the following examples proved?
changing the order of them.

EXAMPLES.

$\frac{1}{3}$lb. of sugar cost $\frac{7}{15}$ of a shilling, what cost $\frac{2}{4}\frac{2}{3}$lb.?
$\frac{2}{5}s.$=4*d.* 3*qrs.*$\frac{4}{6}\frac{2}{6}\frac{7}{5}\frac{1}{5}$.
ell cost $\frac{2}{3}l.$ what cost $\frac{7}{11}$ell? Ans. 15*s.* 8*d.*$\frac{3}{11}\frac{6}{3}$.
ell cost $\frac{7}{13}l.$ what cost 1 ell?. Ans. 18*s.* 10*d.* $\frac{6}{5\,2}$.
oz, of silver cost 16*s.* 5*d.* what cost $\frac{3}{4}$ oz. Ans.
qrs.$\frac{1}{2}$.
yards $\frac{1}{2}$ cost 18*s.* what cost 9 yards $\frac{1}{4}$? Ans. 1*l.* 5*s.*
$\frac{6}{2}$.
dollar be worth 56*d.*$\frac{3}{4}$, what are 500 dollars worth?
l. 18*s.* 4*d.*
yard $\frac{1}{4}$ cost 9*s.* what cost 16 yards $\frac{1}{4}$? Ans. 5*l.* 17*s.*
pistole be 17*s.* $\frac{1}{2}$. what are 100 pistoles? Ans. 86*l.*
oz. cost $1\frac{1}{2}l.$ what cost 1 oz.? Ans. 1*l.* 5*s.* 8*d.*
an ingot of silver weighs 16 oz.$\frac{1}{2}\frac{1}{3}$, what is it worth
per oz.? Ans. 4*l.* 12*s.* 0*d.* 1*qr.*$\frac{9}{1\,3}$.
$\frac{8}{10}$C. cost 14*l.* 4*s.* what will 7C. $\frac{1}{2}$ cost? Ans. 118*l.*

of an ell cost $\frac{7}{3}$ of 19*s.* what cost 7 ells? Ans. 7*l.*
qr.$\frac{3}{5}$.
8lb. of tobacco cost 4*s.* 9*d.*$\frac{3}{4}$, what cost 1lb.? Ans.

1 yard of broadcloth cost 15*s.*$\frac{4}{5}$., what will 4 pieces,
taining 27 yards $\frac{3}{4}$ cost? Ans. 85*l.* 10*s.* 11*d.*$\frac{1}{4}$.
mercer bought $3\frac{1}{2}$ pieces of silk, each containing 24
t 6*s.* 0*d.* $\frac{1}{2}$ per yard. I demand the value of the
at that rate? Ans. 25*l.* 14*s.* 6*d.* 2*qrs.*$\frac{4}{1\,3}$.
$\frac{1}{3}$lb. less by $\frac{1}{6}$ cost 13*d.*$\frac{1}{2}$. what cost 14lb. less by $\frac{1}{4}$ of
ns. 4*l.* 9*s* 9*d.*$\frac{3}{2\,5}$.
merchant had 5C. $\frac{2}{3}$ of sugar, at 6*d.*$\frac{3}{4}$ per lb. which
barter for tea, at 8*s.* $\frac{5}{6}$ per lb. I demand how much
be given for the sugar? Ans. 43 lb.$\frac{1}{3\,5}$
ought 120lb. of tea. at 8*s.*$\frac{5}{6}$ per lb. and sold it for 70*l.*
the gain per cent.? Ans. 35*l.* 5*s.* 3*d.* 3*qrs.* $\frac{7\,5}{1\,4\,4}$.

OF THE SINGLE RULE OF THREE INVERSE IN VULGAR FRACTIONS.

1. If $3\frac{1}{4}$ yards of cloth, that is $1\frac{1}{4}$ yard wide, be sufficient t make a cloak, how much must I have of that sort which is of a yard wide, to make a cloak of the same bigness ? Answe $4\frac{7}{8}$ yards.

2. If 16 men finish a piece of work in $28\frac{1}{2}$ days, how lon will 12 men require to do the same work ? Ans. $37\frac{1}{3}\frac{7}{3}$ day

3. If $1\frac{1}{4}$ yard in breadth require $20\frac{1}{2}$ yards long to make garment, what length will $\frac{3}{4}$ of a yard require to make th same ? Answer, $34\frac{4}{5}\frac{1}{5}$.

4. How many pieces of merchandise, at 20*s*. $\frac{1}{8}$ per piece are to be given for 240 pieces $\frac{1}{4}$, at 12*s*. $\frac{1}{2}$ per piece ? Ans. $149\frac{3}{2}\frac{5}{5}\frac{4}{4}$ pieces.

5. How many yards of canvas, that is 1 yard $\frac{1}{4}$ wide, wil be sufficient to line 20 yards of say, that is $\frac{3}{4}$ of a yard wide ! Answer, 12 yards of canvas.

OF THE DOUBLE RULE OF THREE IN VULGAR FRACTIONS.

1. If 9 students spend 10*l*. $\frac{7}{8}$ in 18 days, how much will 2 students spend in 30 days ? Answer, 39*l*. 18*s*. 4*d*. $\frac{1}{1}\frac{6}{4}\frac{6}{8}$.

2. Three men having worked 19 days $\frac{1}{2}$, received 8*l*. $\frac{1}{10}$ how much must 20 men have for 100 days $\frac{1}{4}$? Ans. 30*5l*. 0 3*d*. $\frac{8}{4}\frac{6}{8}$.

3. A man and his wife having laboured 1 day, earned 4*s*. I demand how much they must have for 10 days $\frac{1}{3}$, when the two sons helped them ? Ans. 4*l*. 17*s*. 1*d*. $\frac{1}{2}$.

4. A man with his family, which in all were 5 persons, d usually drink 7 gallons $\frac{1}{3}$ of beer in a week ; how much wi be drank in 22 weeks $\frac{1}{2}$, when 3 persons more come into the family ? Answer, 280 $\frac{4}{8}\frac{9}{0}$ gallons.

5. Seven men with their wives, upon examining into the expences for 20 weeks past, found that they laid out 40*l*. $\frac{1}{2}$ I demand in what time 20*l*. $\frac{3}{4}$ may be spent by 46 men in th like proportion ? Ans. 3 weeks $\frac{3}{6}\frac{1}{8}\frac{3}{8}\frac{6}{8}$.

6. Three sailors having been aboard 9 months $\frac{1}{4}$, receive 40*l*. $\frac{3}{1}\frac{2}{2}$; I demand how much 100 sailors must receive for 8 *months* $\frac{3}{4}$ *service* ? Answer, 4118*l*. 6*s*. 0*d*. 1*qr*. $\frac{1}{1}\frac{3}{6}\frac{0}{5}\frac{4}{2}$.

PART III.

OF DECIMAL FRACTIONS.

Q. What do you understand by Decimals in general?

A. Any thing which is called one; as one foot, one pound, one shilling, one year, &c. is conceived in imagination to be divided into ten equal parts, and every one of those parts into ten other equal parts, and so on by a Decimal Division without end.

Q. What is a Decimal Fraction?

A. Any number having a point placed before it, thus, .641 is a Decimal.

Q. How do you distinguish a whole number from a Decimal Fraction?

A. Any number having a point placed after it, thus, 641. is a whole number.

Q. What is a mixt number?

A. Any quantity of figures having a point placed some where between them, thus, 6.41, or thus, 64.1, is a mixt number.

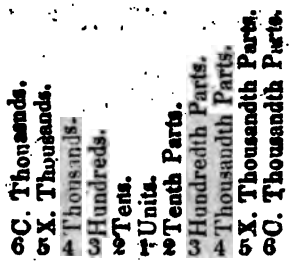
Note. The decimal points must never be omitted, because without it, a decimal cannot be distinguished from a whole or mixt number. But when a whole number alone is given, it is as common to omit it as to insert it; as appears by several examples following.

OF NOTATION OF DECIMALS.

Q. How do Decimal places increase?

A. In the same manner as whole numbers do; that is, by tens; for every place towards the left hand is ten times greater than that which is next it towards the right hand, as appears by the following table:

TABLE.



Q. May not cyphers sometimes be annexed to De

A. They may, but they alter not their value: Th
and .4100 are the same.

Q. May not cyphers sometimes be prefixed to l
parts?

A. Yes; and then they decrease their value by re
them farther from the point: Thus .0041 is less tha

OF ADDITION AND SUBTRACTION OF I CIMALS.

Q. How are Decimals added or subtracted?

A. Place the numbers according to their value, a
as in Addition or Subtraction of whole numbers.

Q. How are the operations proved?

A. As in whole numbers.

EXAMPLES IN ADDITION.

Shillings.	*Yds.*	*Gallons.*
14.471	47.4	7004.16
1.191	19·71	712·712
1.8126	461.721	19.0174
3.6126	400.004	7.3126
7.1281	7.1004	71.1851
18.8126	7.07	3.108

	lb.	Acres.	Ounces.
2	16.18104	.61271	48.9108
	3.14	.8712	1.8191
	1.181	.012	3.1080
1	7.7121	.87	.7012
2	8.19817	.04	.0012
	13.071	.4	.0018

EXAMPLES IN SUBTRACTION.

Years.	Days.	Weeks.	Hours.
081.761	712.10009	127.19	12.
10.00012	7.121	121.	.12

utes.	Months.	Ells.	Tons.
74.1	6100.	.172618	761.1809
1.471	6.109	.0000148	18.2112

OF MULTIPLICATION OF DECIMALS.

ow are Decimals multiplied ?
whole numbers are.
1. When numbers are multiplied, make as many decis in the product, as there are in two factors taken to-

Decimal places are wanted in the product, supply them bers to the decimal point.
serve the same note here, which is given in Multiplica- Vulgar Fractions.
ow are the following examples proved ?
/ inverting the factors.

EXAMPLES.

ply .612	by 4.12	8. Multiply .00041	by .00017
ply 48.	by .48	9. Multiply .0027	by 41.
ply 37.9	by 46.5	10. Multiply 410.	by .0012
ply .121	by 17.2	11. Multiply .07	by .07
ply 1.81	by 71.	12. Multiply 1.007	by .041
ply 4.1	by 1.42	13. Multiply 4.001	by .004
ply .00071	by .121	14. Multiply .004	by .004

OF DIVISION OF DECIMALS.

Q. How are Decimals divided?

A. As whole Numbers are.

Note 1. The decimal places of the divisor and quoti always be equal to those in the dividend.

2. If there be more decimals in the divisor than in dend, annex as many cyphers as you please to the divi as to be equal at least to the divisor.

3. If decimal places are wanting in the quotient, they supplied with cyphers to the decimal point.

4. Observe the same note here, which is given in D Vulgar Fractions.

Q. How are the following examples to be proved

A. By Multiplication.

EXAMPLES.

1. Divide 19.4 by 37.5	7. Divide 9.
2. Divide 47121.1 by 47.	8. Divide 9.
3. Divide 4.18 by .1812	9. Divide 14.
4. Divide 76212 by 41.	10. Divide 1.
5. Divide 612812 by 7.21	11. Divide .01281
6. Divide .121819 by .721	12. Divide .0001219

OF REDUCTION OF DECIMALS.

Case 1.

Q. How do you reduce a Vulgar Fraction to a D

A. Divide the upper term by the lower.

Note 1. Both terms are to be esteemed whole numb

2. By this case, tables containing the decimal parts teger are constructed.

EXAMPLES.

1. Reduce $\frac{5}{26}$ to a decimal. Facit .19
2. Reduce $\frac{5}{28}$ to a decimal. Facit .17
3. Reduce $\frac{11}{14}$ of $\frac{12}{13}$ to a decimal. Facit .6C
4. Reduce 7*s*. 6*d*. to the decimal of a pound. Fa
5. Reduce 10*s*. 9*d*. $\frac{1}{4}$ to the decimal of a poun .5385416+*l*.

e 4C. 2qrs. to the decimal of a ton. Facit .225T.
e 14C. to the decimal of a ton. Facit .7 ton.
ice 174 drams to the decimal of an C. Facit C.
ice 4 inches to the decimal of a yard. Facit yard.
ice 76 yards to the decimal of a mile. Facit mile.
ice 1 mile to the decimal of a league. Facit league.
ice 3qrs. 2nails, to the decimal of a yard. Facit
ce 4 perches to the decimal of an acre. Facit .025
ce 1 pint to the decimal of a gallon. Facit .125
ce 1 gallon of wine to the decimal of a hhd. Facit hd.
ice 7 minutes to the decimal of a day. Facit day.
ice 2 days to the decimal of a week. Facit week.
uce 72 days to the decimal of a year. Facit year.

Case 2.

lo you find the proper quantity of a decimal fraction n parts of an integer ?
ly it by the common parts of the integer.
lo you prove questions in this case ?
se 1.

EXAMPLES.

is the proper quantity of .76 of a pound ? Answer, qr.
is the proper quantity of .861 of an Cwt. ? Answer, 6*oz.* 14.592*dr.*
is the proper quantity of .461 of a shilling ? Ans. rs.
is the proper quantity of .761 of a hhd. of wine ? . 3*qts.* 1.544*pt.*
is the proper quantity of .17 of a ton of wine ? Ans. 6*qts.*
is the proper quantity of .761 of a day ? Answer, in. 50.4*sec.*
is the proper quantity of .7 of a lb. of silver ? Ans.

8. What is the proper quantity of .7[illegible] of 4 oz. of g
Ans. 6 oz. 16 dwts. 19 .2 gr.

9. What is the proper quantity of .67 of a league?
2 miles, 0 fur. 3 poles, 1 yd. 0 feet, 3 in. 1.8 b.c.

10. What is the proper quantity of .712 of a furl
Ans. 28 poles, 2 yards, 1 foot, 11.04 in.

11. What is the proper quantity of .07 of a barrel of
Ans. 2 gals. 1.92 pt.

12. What is the proper quantity .4712 of an ell Engl
Ans. 2 qrs. 1.424 na.

13. What is the proper quantity of .72 of a hhd. of be
Ans. 38 gals. 3.52 qts.

14. What is the proper quantity of .61 of a tun of wi
Ans. 2 hhds. 27 galls. 2 qts. 1.76 pt.

15. What is the proper quantity of .092 of 3 acres, 2 ro
Ans. 1 rood, 11.52 poles.

16. What is the proper quantity of .461 of a chaldr
coal? Ans. 16 bush. 2.384 pecks.

17. What is the proper quantity of .712 of 3 qrs. of
Ans. 17 bush. 2.816 qts.

18. What is the proper quantity of .3 of a year? A
109 days, 12 hrs.

19. What is the proper quantity of .5 of an hour? A
30 minutes.

20. A certain tenant hired an house for 9 years, at 12
per annum; how much was due at the end of the te
Ans. 111*l.* 12*s.*

Note 1. To this case is referred case 4, in Practice, p. 6

EXAMPLES.

1286 at 4*s.*

1st. 4*s.* = 2*l.*

2d. 1286

.2 Facit 257*l.* 4*s.*

257.2

20

4.0

2. Addition and Subtraction of Decimals of different den
nations may easily be performed, after the decimals are red
to their proper quantities.

EXAMPLES.

1. What is the sum of .48*l*. and .16*s*. reduced to thei proper quantities? Ans. 9*s*. 9.12*d*.

2. What is the sum of .17lb. troy, and .84 oz.? Ans oz. 17dwts. 14.4 grains.

3. What is the sum of .17 ton, .19 C. .17 qr. and .7lb. Ans. 3C. 2qrs. 15.54lb.

4. What is the difference between .17*l*. and .7*s*.? Ans 8*d*. 1.6 qrs.

5. What is the difference between .41 days and .16 hours Ans. 9 hours, 40 minutes, 48 seconds.

OF THE SINGLE RULE OF THREE DIRECT IN DECIMALS.

Q. How do you prove the following questions?

A. By changing their order.

EXAMPLES.

1. If 1.4lb. of mace cost 14.5*s*. what cost 75.31 lb.? Ans 8*l*. 19*s*. 11*d*. 3.52*qrs*.

2. If 1.6 C. of sugar cost 3*l*. 12.76*s*. what cost 3 hhds each 11 C. 3qrs. 10.12lb.? Ans. 80*l*. 15*s*. 3*d*. 3.36*qrs*.

3. If 1.5 oz. of silver be worth 7.8*s*. what is the value o .7lb.? Ans. 30*l*. 5*s*. 3*d*. 1.44*qr*.

4. If 1.47 C. of sugar be worth 4.5*l*. what is 1.7lb. worth at that rate? Ans. 11.1*d*.

5. If 1 pint of wine cost 1.2*s*. what cost 12.5 hhds.? Ans 378*l*.

6. If 8.4 lb. of tobacco cost 16*s*. 4.6*d*. what cost 3 hhds each 4 C. 2 qrs. 7.4 lb.? Ans. 149*l*. 12*s*. 3*d*. 2*qrs*.

7. If a yard of cloth cost 12.3*s*. what cost 3 pieces, each 21.5 yards? Ans. 39*l*. 13*s*. 4.2*d*.

8. A man bought a piece of cloth for 6*l*. 13.12*s*. I demand how many yards there were in the same, when he gave after the rate of 4*s*. 2.9*d*. per yard? Ans. 31.569 yards.

9. A man bought 5.8 tons of oil for 60.4*l*. but by misfortune it chanced to leak out 50.9 gallons; I demand how he must sell the rest per gallon to be no loser? Ans. 10.27*d* per gallon.

10. Two men bartered, A had 40.7 yards of linen, for which B gave him 25.6 ells of holland, at 4.5*s*. per ell. I demand the price of the linen per yard? Ans. 2*s*. 9*d*. 3.8*qr*

13. A grocer bought 3 C. 1.5 qr. of cloves, at th
2.75*s.* per lb. and sold them for 60*l.* 11*s.* 6*d.* wha
gain or lose by the bargain? Ans. he gained 8*l.* 12*s.*

14. A merchant bought 436 yards of cloth for
yard, and sold it again for 10.75*s.* per yard, what di
by the sale thereof? Ans. 49*l.* 1*s.* gain.

15. A owes B 296.85*l.* but he compounds for 7.
pound; what must B receive for his debt? Ans.
4*d.* 2*qrs.*

16. Bought 3 hhds. of tobacco, each weighing 4
at 5.6*l.* per C. which I sold out at 7*l.* 16*s.* per C.
I gain by the whole? Ans. 29*l.* 10*s.* 8*d.* 1.6*qr.*

17. A jeweller bought a diamond for 60 guineas:
it was neatly cut, weighed 1.5 oz. which he sold
3.25*s.* per grain: I demand how much he gained b
diamond; and also at what rate per cent. he made

Ans. { Whole gain 54*l.* 0*s.* 0*d.* 0*qr.*
{ Gain per cent. 85 14 3 1.7+

A TABLE OF POWERS.

Roots or First Powers	1	2	3	4	5	6	7	8	9
Squares, or Second Powers	1	4	9	16	25	36	49	64	81
Cubes, or Third Powers	1	8	27	64	125	216	343	512	729
Biquadrates, or Fourth Powers	1	16	81	256	625	1296	2401	4096	6561
Sursolids, or Fifth Powers	1	32	243	1024	3125	7776	16807	32768	59049
Square Cubes, or Sixth Powers	1	64	729	4096	15625	46656	117649	262144	531411
SecondSursolids, orSeventhPowers	1	128	2187	16384	78125	279936	823543	2097152	4782969
Biquadrates squared, or 8th Powers	1	256	6561	65536	390625	1679616	5764801	16777216	43046721
Cubes Cubed, or Ninth Powers	1	512	19683	262144	1953125	10077696	40353607	134217728	387420489
Sursolids squared, or Tenth Powers	1	1024	59049	1048576	9765625	60466176	282475249	1073741824	3486784401
ThirdSursolids, orEleventhPowers	1	2048	177147	4194304	48828125	362797056	1977326743	8589934592	28381059609
SquareCubessquared, or12thPowers	1	4096	531441	16777216	244140625	2176782336	13841287201	68719476736	282429536481
Fourth Sursolids, or 13th Powers	1	8192	1594323	67108864	1220703125	13060694016	96889010407	549755813888	2541865828329
Fifth Sursolids squared, or 14th Powers	1	16384	4782969	268435456	6103515625	78364164096	678223072849	4398046511104	22876792454961
Sursolids cubed, or FifteenthPowers	1	32768	14348907	1073741824	30517578125	470184984576	4747561509943	35184372088832	205891132094649

OF THE SQUARE ROOT.

Q. What is a Square?

A. Any number multiplied by itself, produces a s

Q. What is the extraction of the square root?

A. If a square be given to find one side, it is c extraction of the square root.

Q. How is the given square to be prepared for ex

A. By pointing off at every two figures, from t place, both ways for a resolvend.

Q. What is a Surd?

A. It is an imperfect square, or such a numbe Square Root can never be exactly found.

EXAMPLES.

1. What is the square of 17.1?	Ans. 29
2. What is the square of .09?	Ans. .0
3. What is the square of .0094?	Ans. .0
4. What is the square root of 4712.81261?	Ans. 68
5. What is the square root of 9712.718051?	Ans. 98
6. What is the square root of 3.1721812?	Ans. 1.
7. What is the square root of 1.3976121?	Ans. 1.
8. What is the square root of 761.801216?	Ans. 27
9. What is the square root of .0007612816?	Ans. .0
10. What is the square root 4.000067121?!	Ans. 2.

11. There is an army consisting of a certain n men, who are placed rank and file, that is, in the square, each side having 472 men; I demand h men the whole squate contains? Ans. 222784 men

12. The floor of a certain great room is mad square, each side of which contains 75 feet; I de many square feet are contained therein? Ans. 56

13. Suppose 12544 soldiers are to be put into ran in the form of an equal square; I demand how mar will be in the front, and how many deep? Ans. 11

14. A certain square pavement contains 1971 stones, all of the same size; I demand how man tained in one of its sides? Ans. 444.

5. The wall of a town is 17 feet high, which is surrounded by a moat of 20 feet in breadth; I demand the length of ladder which shall reach from the outside of the moat to the top of the wall? Ans. 26.2+feet.

OF THE SQUARE ROOT OF A VULGAR FRACTION.

How is the square root of a vulgar fraction extracted?

1. Reduce the fraction to its lowest terms.

Extract the square root of the numerator for a new numerator, and the square root of the denominator for a new denominator.

If the fraction be a surd, reduce it to a decimal, and extract the square root from it.

The decimal fractions must consist of an even number of places, as two, four, &c.

EXAMPLES.

What is the square root of $\frac{324}{441}$? Ans. $\frac{2}{3}$.
What is the square root of $\frac{2116}{4624}$? Ans. $\frac{1}{2}$.
What is the square root of $\frac{7396}{9216}$? Ans. $\frac{7}{8}$.

SURDS.

What is the square root of $\frac{3136}{6084}$? Ans. .71528+
What is the square root of $\frac{1369}{2401}$? Ans. .87447+
What is the square root of $\frac{3136}{7569}$? Ans. .72414+

OF THE SQUARE ROOT OF A MIXT NUMBER.

How is the square root of a mixt number extracted?

1. Reduce the fractional part of the mixt number to its least term.

Reduce the mixt number to an improper fraction.

Extract the roots of the numerator and denominator, for a new numerator and denominator.

If the mixt number given, be a surd, reduce the fractional part to a decimal, and annex it to the whole number, and extract the square root from the whole.

EXAMPLES.

What is the square root of $37\frac{3}{16}$? Ans. $6\frac{1}{4}$.
What is the square root of $17\frac{1}{25}$? Ans. $4\frac{1}{5}$.
What is the square root of $5\frac{29}{64}$? Ans. $2\frac{1}{3}$.

SURDS.

What is the square root of $76\frac{1}{11}$? Ans. 8.76489+
What is the square root of $7\frac{2}{11}$? Ans. 2.7981+

OF THE CUBE ROOT.

Q. What is a Cube?

A. Any number multiplied by its square, produces

Q. What is the extraction of the cube root?

A. If a cube be given to find out a number, whi multiplied into its square, produceth the number giv be called the extraction of the cube root.

Q. How is the given cube to be prepared for ext

A By pointing off at every three figures both wa the unit's place, for a resolvend.

Q What is a surd?

A. It is an imperfect cube, or such a number, wh root can never be exactly found.

Q. What is the rule for extracting the cube root o ber?

A. This: the first figure sought is the root of the cube contained in the first member, and it is called $3aa+3a$ is the divisor, which finds a new figure calle $3aae+cca+3ccc$ is the subtrahend or the number to ducted; which operation is to be continued to every re

Note. This rule being somewhat dark, I shall by illustration, subjoin the operation at large, for extra cube root of any number,

What is the cube root of 444194.947?

(1) Let the given number be pointed as before

thus 444194.947

(2) The first member, which contains the greates 444; and the nearest root, whose cube is not greate is 7, which set.

thus 444194.947(7

(3) The cube of 7 is 343, which set down and annexing the next three figures or members, viz. resolvend;

thus 444194.947)7
343

101194 Resolvend.

(4) The number 7, in the root is called a; the Rule $3aa+3a$ is the divisor.

$7=a$
$7=a$

$49=aa$ | 444194.947(7
3 | 343

$147=3aa$ | 1491)101194 Resolvend
$21=3a$

Divisor $1491=3aa+3a$.

) The next figure in the root, viz. 6 (found by common ion) is called e; then by the rule $3aae+3eea+eee$ is ubtrahend, or number to be subducted; thus,

$147=3aa$ | eee viz. $6^3=216$ | $6=e$
$6=e$ | | $6=e$

$882=3aae$ | | $36=ee$
$756=3eea$ | | 3
$216=eee$ | | $108=3ee$
b. $95976=3aae+3eea+3ee$ | | $7=a$
| | $756=3eea$

444194.947(76
343

1491)101194 Resolvend.
95976 Subtrahend.

5218.947 Resolvend.

.) When the next number is brought down, viz. 947 as e, both figures in the root, viz. 76, must be called a; to find a divisor to this last resolvend, say, as before, $+3a$; thus,

$76=a$
$76=a$

456
532

$5776=aa$
3

$17328=3aa$
$228=3a$

$76=$
$3=$

$228=3a$

444194.947(76
343

1491)101194 Resolvend.
95976 Subtrahend.

173508)5218.947 Resolvend.

vis. $173508=3aa+3a$

OF THE BIQUADRATE ROOT.

Q. What is a Biquadrate number?

A. Any number involved four times produces a biqu

Q. How is the biquadrate root extracted?

A. First extract the square root of the given resolv and then extract the square root of that square root, biquadrate root required.

EXAMPLES.

1. What is the biquadrate of 48? Ans. 53
2. What is the biquadrate of 96? Ans. 3
3. What is the biquadrate root of 5308416? Ans.
4. What is the biquadrate root of 81? Ans.
5. What is the biquadrate root of 27? Ans.

OF THE SURSOLID ROOT.

Q. What is a sursolid?

A. Any number involved five times produces a sursol

Q. How is the sursolid root, or the root of any odd power extracted?

A. By the following general rules.

1. If any even power be given, let the square root of extracted, which reduces it to half of the given power, the square root of that power reduces it to half of the power; and so on till you come to a square or a cube.

For example; Suppose a 24th power be given, the square root of that reduces it to a 12th power, the square root of 12th power reduces it to a 6th power, and the square ro of the 6th power to a cube.

2. If any odd power be given, as the 17th, &c. observe

(1) From the unity place, both ways, point off as many such number of figures as is the index of the power for the solvend.

(2) Seek in the table of powers, for such a power (be the same power with the index) as comes nearest the first period, whether greater or less, calling its root accordingly more than just, or less than just.

(3) Annex to many ciphers to the root, as there are periods of whole numbers in the given resolvend.

(4) Find the difference between the given resolvend, and the power coming nearest the first period.

(5) Whatever odd power is given, the next lowest even power to that of the said root must be found with its annexed *ciphers*; *i. e.* if the 9th power be given, find the 7th power *of the root* and cyphers; if the 11th power be given, *the 9th*, &c.

) Multiply the next lowest odd power by the index of iven power, and let that product be a divisor to the dif- ce between the given resolvend and power first found, depresses it to a square.

Point this square into periods of two figures each.

Then make the first root without its cipher a divisor, k how often it may be found in the first period of the

If the divisor be less than just, you must multiply the nt figure by half the index, i. e. if the index be 11, ly the quotient figure by 5: if the index be 9, multiply , &c. and add it to the divisor, but if it be more than just, ust subtract it from the divisor, having a cypher annex- supposed to be annexed to the divisor; which sum or nce must be multiplied by the said quotient figure and tinued to every new figure in the quotient.

) If the first root with its ciphers be more than just, otient must be subtracted from it: but if it be less than t must be added to it; and the sum or difference will root required.

If an even power be given, and the square root of that be extracted, reduce it to an odd power: you must ed with that odd power as the foregoing rules direct.

EXAMPLES.

What is the sursolid of 6436343?

436343

2 the nearest sursolid, whose root and cipher is 20.

236343

ube of 20 is=8000

)00× 5 is=40000

n 40000(3236343(80 Lastly 20

ain 2 + 3

-3×2=6 —

— 23 the sursolid

livisor 26)80(3 root required.

78

2 to be rejected.

e. This is a very expeditious way of extracting the roots of owers, but it is not always exact, because (as Mr. Ward es, for it was taken from him) there will be a remainder metimes an excess or defect in the last figure of the root, the given resolvend or power hath a true root—as appears *fifth example following*, whose true root should not be *as it there stands*, but 384.

2. What is the sursolid of 48 ? Ans. 2548038
3. What is the sursolid root of 8153726976 ? Ans.
4. What is the sursolid root of 254803968 ? Ans.
5. What is the sursolid root of 83494164234 24 ? Ans.

OF THE SQUARE CUBE ROOT.

Q. What is a Square Cube ?

A. Any number involved six times, produces a sq cube.

EXAMPLES.

1. What is the square cube of 48 ? Ans. 1223059
2. What is the square cube root of 782757789696 ? Ans. 96.
3. What is the square cube root of 12230590464 ? Ans. 48.
4. What is the square cube root of 3206175906594816 ? Ans. 384

OF THE SECOND SURSOLID ROOT.

Q. What is the Second Sursolid ?

A. Any number involved seven times, produces a sursolid.

EXAMPLES.

1. What is the 2d. sursolid of 96. Ans. 751447478
2. What is the second sursolid root of 75144747810816 ? Ans. 9
3. What is the second sursolid root of 587068342272 ? Ans. 4
4. What is the second sursolid root of 1231171548132409344 ? Ans. 3

OF THE SQUARE BIQUADRATE ROOT.

Q. What is a Square Biquadrate ?

A. Any number involved eight times, is a biqu squared, or a square biquadrate ?

EXAMPLES.

1. What is the squared biquadrate of 48. Ans. 2817928042905
2. What is the square biquadrate root of 7213895789838336 ? Ans. 96.
3. What is the square biquadrate root of 281792804290 56 ? Ans. 48.
4. What is the square biquadrate root of 4727698744828451880 96 ? Ans. 384.

OF THE CUBED CUBE ROOT.

is a Cubed Cube ?
umber involved nine times is a cubed cube.

EXAMPLES.

s the cubed cube root 5824480256 ?	Ans. 96.
s the cubed cube root 60594688 ?	Ans. 48.
s the cubed cube root 1801412552228864	Ans. 384.

THE SQUARE SURSOLID ROOT.

is a Squared sursolid ?
umber involved ten times, produces a squared

EXAMPLES.

s the squared sursolid root 108545024 ?	Ans. 48.
s the squared sursolid root 599150104576 ?	Ans. 96,
s the squared sursolid root 611742420055883776 ?	Ans. 384.

F THE THIRD SURSOLID ROOT.

is a Third Sursolid ?
umber involved eleven times produces a third

EXAMPLES.

s the third sursolid root 7913927 ?	Ans. 23.
s the third sursolid root 81210161152 ?	Ans. 48.
s the third sursolid root 05518410039296 ?	Ans. 96.

HE SQUARED SQUARE CUBE ROOT.

is a Squared Square Cube ?
umber involved twelve times produces a square

EXAMPLES.

s the root of this squared square 7343098087735296 ?	Ans. 48.
s the root of this squared square 9757329767363772416 ?	Ans. 96.
s the root of this squared square 5639440290902917603980738356 ?	Ans. 384.

A General Rule for extracting the Roots of all Powers.

1. PREPARE the given number for extraction by pointing off from the unity place, as the root required directs.
2. Find the first figure in the root by your own judgment, or by inspection into the table of powers.
3. Subtract it from the given number.
4. Augment the remainder by the next figure in the given number, that is by the first figure in the next point, and call this your dividend.
5. Involve the whole root, last found, into the next inferior power to that which is given.
6. Multiply it by the index of the given power, and call this your divisor.
7. Find a quotient figure by common division, and annex it to the root.
8. Involve all the root thus found, into the given power.
9. Subtract this power (always) from as many points of the given power as you have brought down, beginning at the lowest place.
10. To the remainder bring down the first figure of the next point for a new dividend.
11. Find a new divisor as before, and in like manner proceed till the work is ended.

EXAMPLES.

1. What is the cube root of 115501803?

```
        115501303.(487
          64
       48)515  dividend
          110592  subtrahend
     6912)49093  dividend
        115501303  subtrahend
        ---------
                0
```

```
4 ×   4 ×   3 = 48 divisor
48 ×  48 ×  48 = 110592 subtrahend
48 ×  48 ×   3 = 6192 divisor
487 × 487 × 487 = 115501303 subtrahend
```

2 What is the biquadrate root of 56249134561?

```
                56249134561.(487
                256
256)3064 dividend
                5308416 subtrahend
442368)3164974 dividend
                56249134561 subtrahend
                ----------
                          0
                          -
```

4 × 4 × 4 × 4 = 256 divisor
48 × 48 × 48 × 48 = 5308416 subtrahend
48 × 48 × 48 × 4 = 442368 divisor
487 × 487 × 487 × 487 = 56249134561 subtrahend

Note. This general rule I received from my worthy friend WILLIAM MONTAINE, Esq. F. R. S. and teacher of the Mathematics at Shad-Thames.

OF SIMPLE INTEREST.

Q. What particular letters are used here?
A. These: *P*, any principal.
T, the time.
R, the ratio of the rate per cent.
A, the amount.
Q. What is the ratio?
A. It signifies only the simple interest of 1*l.* for one year, at any proposed rate of interest per cent. and is thus found:

100 : 6 :: 1 : 0.06
100 : 5 :: 1 : 0.05

A TABLE OF RATIOS.

Rate per Cent.	Ratio.	Rate per Cent.	Ratio.
2	.02	6½	.065
3	.03	7	.07
3½	.035	7½	.075
4	.04	8	.08
4½	.045	8½	.085
5	.05	9	.09
5½	.055	9½	.095
6	.06	10	.1

Case 1.

Q. When P T and R are given to find covered ? A. Thus ; $ptr+p=a$.

Note. Any quantity of letters put togethe note continual multiplication.

EXAMPLES.

1. What sum will 567*l.* 10*s.* amount to per cent. per annum ?

2. What will 508*l.* 14*s.* amount to in 1 y per annum ? Ans. 534

3. What will 600*l.* 14*s.* amount to in 1 cent. per annum ? Ans. 871

4. What will 4000*l.* amount to in 5 yea per annum ?

Note. When the time given does not con then reduce the odd time into decimal parts less such parts of a year chance to be $\frac{1}{4}$, $\frac{1}{2}$ best way will be to reduce the odd time into with the decimal parts of a year, that are equi

Table for the ready finding the Decimal Pa to any number of Days, or Quarters

Days.	Decimal Parts.	Days.	Decimal Parts.	Day
1	.00274	10	.027397	1(
2	.005479	20	.054795	2(
3	.008219	30	.082192	3(
4	.010959	40	.109589	3(
5	.013699	50	.136986	—
6	.016438	60	.164384	$\frac{1}{3}$ (
7	.019178	70	.191781	$\frac{1}{2}$ (
8	.021918	80	.219178	$\frac{2}{4}$ (
9	.024658	90	.246575	

Note. When the true number of days can view in this table, then both them and thei taken out of the table at twice or thrice, as th and added together. So the decimal pa days, are thus found.

200=.547945
30=.082192
6=.016438

EXAMPLES.

5. What will 7200*l.* amount to in $6\frac{1}{2}$ y*per annum ?* Ans. 9540*l.*

6. What will 1110*l.* 18*s.* amount to in 12¾ years, at 5 per cent. per annum? Ans. 1819*l.* 1*s.* 11*d.* 2.8*qrs.*

7. What will 280*l.* 10*s.* amount to in 3 years and 148 days, at 5 per cent. per annum? Ans. 328*l.* 5*s.* 2*d.* 3.38+*qrs.*

8. What will 196*l.* amount to in 189 days, at 4 per cent. per annum? Ans. 200*l.* 1*s.* 2*d.* 1.23+*qrs.*

Case 2.

Q. When A, T and R are given to find P, how is it discovered?

A. Thus: $\frac{a}{tr+1}=p.$

EXAMPLES.

1. I demand what principal will amount to 873*l.* 19*s.* in 9 years, at 6 per cent. per annum? Ans. 567*l.* 10*s.*

3. I demand what principal will amount to 534*l.* 2*s.* 8*d.* 1.6*qr.* in 1 year, at 5 per cent. per annum? Ans. 508*l.* 14*s.*

3. I demand what principal will amount to 9540*l.* in 6½ years, at 5 per cent. per annum? Ans. 7200*l.*

4. I demand what principal will amount to 1819*l.* 1*s.* 11*d.* 2.8*qrs.* in 12¾ years, at 5 per cent. per ann.? Ans. 1110*l.* 18*s.*

5. I demand what principal will amount to 871*l.* 0*s.* 3*d.* 2.4*qrs.* in 10 years at 4½ per cent. per annum? Ans. 600*l.* 14*s.*

6. I demand what principal will amount to 4700*l.* in 5 years, at 3½ per cent. per annum? Ans. 4000*l.*

7. I demand what principal will amount to 328*l.* 5*s.* 2*d.* 3.38*qrs.* in 3 years and 148 days, at 5 per cent. per annum? Ans. 280*l.* 10*s.*

8. What principal being put to interest for 189 days, at 4 per cent. will amount to 200*l.* 1*s.* 2*d.*½? Ans. 196*l.*

Case 3.

Q. When A, P, and T, are given to find R, how is it discovered?

A. Thus: $\frac{a-p}{tp}=r.$

EXAMPLES.

1. At what rate per cent. will 567*l.* 10*s.* amount to 873*l.* 19*s.* in 9 years? Ans. 6*l.* per cent.

2. At what rate per cent. will 508*l.* 14*s.* amount to 534*l.* 2*s.* 8*d.* 1.6*qr.* in 1 year? Ans. 5*l.* per cent.

3. At what rate per cent. will 7200*l.* amount to 9540*l.* in 6½ years? Ans. 5*l.* per cent.

4. At what rate per cent. will 1110*l.* 18*s.* amount to 1819*l.* 1*s.* 11*d.* 2.8*qrs.* in 12¾ years? Ans. 5*l.* per cent.

5. At what rate per cent. will 600*l.* 14*s.* amount to 871*l.* 0*s.* 3*d.* 2.4*qrs.* in 10 years? Ans. 4½*l.* per cent.

6. At what rate per cent. will 4000*l.* amount to 4700*l.* in 5 years? Ans. 3½ per cent.

7. At what rate per cent. will 280*l.* 10*s.* amount to 328*l.* 5*s.* 2*d.* 3.38*qrs.* in 3 years and 148 days? Ans. 5 per cent.

8. At what rate per cent. will 196*l.* amount to 200*l.* 1*s.* 2*d.* ¼ in 189 days? Ans. 4*l.* per cent.

Case 4.

Q. When A, P, and R, are given to find T, how is it discovered?

A. Thus: $\frac{a-p}{rp}=t$

EXAMPLES.

1. In what time will 567*l.* 10*s.* amount to 873*l.* 19*s.* at 5 per cent.? Ans. 9 years.

2. In what time will 508*l.* 14*s.* amount to 534*l.* 2*s.* 8*d.* 1.6*qr.* at 5 per cent.? Ans. 1 year.

3. In what time will 7200*l.* amount to 9540*l.* at 5 per cent.? Ans. 6½ years.

4. In what time will 1110*l.* 18*s.* amount to 1819*l.* 1*s.* 11*d.* 2.8*qrs.* at 5 per cent,? Ans 12¾ years.

5. In what time will 600*l.* 14*s.* amount to 871*l.* 0*s.* 3*d.* 2.4*qrs.* at 4½ per cent.? Ans. 10 years.

6. In what time will 4000*l.* amount to 4700*l.* at 3½ per cent.? Ans. 5 years.

7. In what time will 280*l.* 10*s.* amount to 328*l.* 5*s.* 2*d.* 3.38*qrs.* at 5 per cent.? Ans. 3 years, 148 days.

8. In what time will 196*l.* amount to 200*l.* 1*s.* 2*d.* ¼ at 4 per cent.? Ans. 189 days.

OF ANNUITIES OR PENSIONS IN ARREARS.

Q. What is meant by annuities or Pensions in Arrears?

A. Annuities or pensions are said to be in arrears, when they are payable either yearly, half-yearly, or quarterly, and are unpaid for any number of payments.

Note. U represents the Annuity, Pension, &c. R, T, and A, as before.

Case 1.

Q. When U, R, and T, are given to find A, how is it discovered?

A. Thus: $\frac{tut-tu}{2}\times r+tu=a$

EXAMPLES.

1. If an annuity of 70*l.* be forborn 5 years, what will it amount to at 5 per cent.? Ans. 385l.

2. If the payment of a pension be omitted for 7 years, what ill be the amount in that time at 6*l.* per cent. when the pen- is 56*l.* per ann. ? Ans. 462*l.* 11*s.* 2*d.* 1.6*qr.*

3. A house is let upon lease for 7 years, at 50*l.* per ann. lemand the amount for that time at 4*l.* per cent. for the for- arance of payment ? Ans. 392*l.*

4. Suppose a salary of 100*l.* per ann. be forborn 7 years, at is the amount at 4½ per cent. ? Ans. 794*l.* 10*s.*

ote. When the annuities or rents are to be paid by half yearly, quarterly payments, as most generally they are, then or half-yearly payments, take always half of the ratio, half ne yearly rent, and twice the number of years—that is, re- e the years into half years, for R, U, and T——But or quarterly pavments, take a fourth part of the ratio, a fourth t of the yearly rent. and four times the number of years, that educe the years into quarters, and work as before.

. If 70*l.* annuity, payable every half-year, were unpaid 5 s, what will it amount to in that time, at 5 per cent. ? . 389*l.* 7*s.* 6*d.*

. If 70*l.* annuity, payable every quarter, were unpaid 5 s, what will it amount to in that time, at 5 per cent. ? . 391*l.* 11*s.* 5*d.*

te. By comparing these two examples with the first, it may bserved, that the amount of half-yearly payments is more ntageous than yearly payments, and quarterly than half- ly payments.

Case 2.

. When A, R, and T, are given to find U, how is it dis- ered ?

A. Thus : $\frac{2a}{trt-tr+t}=u$

EXAMPLES.

. If the amount of an annuity for 5 years, at 5 per cent. 385*l.* what is the annuity ? Ans. 70*l.*

. If the amount of a pension be 462*l.* 11*s.* 2*d.* 1.6*qr.* the be 7 years, and the rate per cent. 6*l.* what is the pension ? . 56*l.*

If a house be let upon a lease for 7 years, and the amount hat time be 392*l.* at 4 per cent. what is the yearly rent ? . 50*l.*

. If a salary amounts to 794*l.* 10*s.* in 7 years, at 4½ per . what is the salary ? Ans. 100*l.* per ann.

te. When the payments are half-yearly, 4*a* must be divided, n they are quarterly, then 8*a* must be divided as before.

. If the amount of an annuity, payable half-yearly, for 5 s, *at 5 per cent.* be 389*l.* 7*s.* 6*d.* what is the annuity ? Ans.

6. If the amount of an annuity, payable quarterly, for years, at 5 per cent. be 391*l.* 11*s.* 3*d.* what is the annuity Ans. 70*l.*

Case 4.

Q. When U, A, and T, are given to find R, how is it discovered?

A. Thus : $\frac{2a-2ut}{utt-ut}=r.$

EXAMPLES.

1. If an annuity of 70*l.* per ann. amounts to 385*l.* in 5 years I demand the rate per cent. ? Ans. 5*l.*

2. If a pension of 56*l.* per ann. amounts to 462*l.* 11*s.* 2*d.* 1.6*qr.* in 7 years, what is the rate per cent. ? Ans. 6*l.*

3. If a house be let upon lease for 7 years, at 50*l.* per ann. and the amount for that time be 392*l.* what is the rate per cent. ? Ans. 4*l.* per cent.

4. If a salary of 100*l.* per annum, being forborn 7 years amounts to 794*l.* 10*s.* I demand the rate per cent ? Ans. 4½

Note. When the payments are half-yearly, then $4a-4ut$ must be divided ; but when they are quarterly, then $8a-8ut$ must be divided as before.

5. If an annuity of 70*l.* per ann. payable half yearly, being forborn 5 years, amount to 389*l.* 7*s.* 6*d.* I demand the rate per cent. ? Ans. 5*l.* per cent.

6. If an annuity of 70*l.* per ann. payable quarterly, amount to 391*l.*. 11*s.* 3*d.* in 5 years, I demand the rate per cent. Ans. 5 per cent.

Case 4.

Q. When U, A, and R, are given to find T, how is it discovered?

A. Thus : First $\frac{2}{r}-1=x.$

Secondly, $\left|\frac{2a}{\sqrt{ru}}+\frac{xx}{4}\right.-\frac{1}{2}x=t.$

EXAMPLES.

1. In what time will 70*l.* per ann. amount to 385*l.* forborn at 5 per cent. ? Ans. 5 years.

2. In what time will a pension of 56*l.* per ann. amount to 462*l.* 11*s.* 2*d.* 1.6*qr.* at 6 per cent. ? Ans. 7 years.

3. If a house be let upon lease, for a certain time for 50*l.* per annum, and the amount be 392*l.* at 4 per cent. I demand the time that it was let for ? Ans. 7 years.

4. If a salary of 100*l.* per annum being forborn a certain *time, amounts* to 794*l.* 10*s.* at 4½ per cent. I demand *time of forbearance* ? Ans. 7 years.

If the payments were half-yearly, then T will be equal mber of half-years, or payments : but if they were to quarterly, then T will be equal to the number of quar- yments.

an annuity of 70*l.* per annum, payable half-yearly, orborn, amounts to 389*l.* 7*s.* 6*d.* at 5 per cent. I de- he time and payments forborn? Answer, 10 pay- =5 years.

f an annuity of 70*l.* per ann. payable quarterly, be- rborn, amounts to 391*l.* 11*s.* 3*d.* at 5 per cent. I de- the time and payments forborn? Answer, 20 pay- =5 years.

THE PRESENT WORTH OF ANNUITIES, OR PENSIONS, &c.

ote. P represents the present worth—U, T, and R, as in the *Case* 1.

1. When U, T, and R, are given to find P, how is it dis- ered? $rtt—rt+2t$

A. Thus: $\frac{}{2rt+2} \times u = p.$

EXAMPLES.

1. What is the present worth of 50.*l* per ann. to continue ears at 5 per cent.? Ans. 259*l.* 12*s.* 3*d.* $2.7+qrs.$

2. What is 80*l.* yearly rent, to continue 5 years, worth in ady money, at 6 per cent.? Ans. 344*l.* 12*s.* 3*d.* $2.7+qrs.$

3. What is a salary of 40*l.* per ann. to continue 7 years, th in ready money, at 4 per cent.? Ans. 245*l.*

4. What is a pension of 30*l.* per ann. for 5 years worth in ady money, at 4½ per cent. Ans. 133*l.* 9*s.* 4*d.* $2.6+qrs.$

Note. Observe the same note here, which is given in Case 1, Annuities and Pensions in arrears, concerning half-yearly and arterly payments.

5. What is the present worth of 50*l.* per ann. payable lf-yearly for 6 years, at 5 per cent.? Ans. 262*l.* 10*s.*

6. What is the present worth of 50*l.* per ann. payable arterly for 6 years, at 5 per cent.? Ans. 263*l.* 18*s.* 10*d.*+

Note. By comparing these two examples with the first, i y be observed, that the present worth of half-yearly pay nts is more advantageous than yearly payments, and the pr t worth of quarterly than half-yearly payments.

Case 2.

Q. When P, T and R, are given to find U, how is it di vered? $rt+1$

A. Thus: $\frac{}{rtt—rt+2t} \times 2p = u.$

EXAMPLES.

1. There is a lease of a house 6 years to come; I de the yearly rent, when the present worth at 5 per ce 259*l.* 12*s.* 3*d.* 2.4 *qrs.* ? Ans. 50*l.* per ann.

2. What yearly rent is that, the present worth of w for 5 years is 344*l.* 12*s.* 3*d.* 2*qrs.* at 6 per cent. ? Ans. per ann.

3. What salary is that which for 7 years continuance per cent. produces 245*l.* for the present worth ? Ans. per ann.

4. If the present worth of a pension to continue 5 y at 4½ per cent. be 133*l.* 9*s.* 4*d.* ¾, I demand the pens Ans. 30*l.*

Note. When the payments to be made are half-yearly, must multiply by 4*p*, but when they are quarterly, then m ply by 8*p* to find *u*.

5. There is a lease of a house, payable half-yearly, years to come, I demand the yearly rents, when the pr worth at 5 per cent. is 262*l.* 10*s.* ? Ans. 50*l.*

6. There is a lease of a house, payable quarterly, years to come, I demand the yearly rent, when the pr worth at 5 per cent. is 263*l.* 18*s.* 9*d.* 3.6 *qrs.* ? Ans. £

Case 3.

Q. When U, P, and T, are given to find R, how is covered ?

A. Thus: $\frac{2ut-2p}{2rt-utt+ut}=r.$

EXAMPLES.

1. I demand at what rate per cent. will the yearly rent to continue 6 yeaas, produce the present worth of 259*l.* 1 2*qrs.* ? Ans. 5*l.* per cent.

2. If the yearly rent of 80*l.* per annum to continue 5 bring 344*l.* 12*s.* 4*d.* 3 *qrs.* present worth, what is the ra cent. ? Ans. 6*l.* per cent.

3. If a salary of 40*l.* per ann. to continue 7 years, p 245*l.* for the present worth. what is the rate per cent. ? 4*l.* per cent.

4. If a pension of 30*l.* per annum to continue 5 years duce 133*l.* 9*s.* 4*d.* 2 *qrs.* for the present worth, what is t per cent. ? Ans. 4½*l.*

Note. When the annuities or rents are to be paid half- or quarterly, then,

For half-yearly payments take half of the annuity or rents and twice the number of years, that is, reduce th into half-years, and then the quotient of the upper part by the lower will be the ratio of half the rate per cent. I

For quarterly payments, take a fourth part of the annuity

ly rent, and four times the number of years; that is, reduce the years into quarters; and then the quotient of the upper part divided by the lower will be the ratio of a 4th part of the rate per cent.

5. If the lease of a house of 50*l.* per ann. payable half-yearly, having 6 years to come, is sold for 262*l.* 10*s.* I demand the rate per cent. ? Ans. 5*l.* per cent.

6. A lease of a house of 50*l.* per ann. payable quarterly, having 6 years to come, is sold for 263*l.* 18*s.* 9*d.* 3 *qrs.* I demand the rate per cent. ? Ans. 5*l.* per cent.

Case 4.

Q. When U, P, and R, are given to find T, how is it discovered ?

A. Thus : first, $\frac{2}{r} - \frac{2p}{u} - 1 = x.$

Secondly, $\sqrt{\left|\frac{2p}{ru} + \frac{xx}{4} - \frac{x}{2}\right.} = t.$

EXAMPLES.

1. If 50*l.* yearly rent produce the present worth of 259*l.* 12*s.* 3*d.* 2 *qrs.* at 5 per cent. what is the time of its continuance ? Ans. 6 years.

2. I demand how long 80*l.* per ann. may be purchased for 344*l.* 12*s.* 3*d.* 2 *qrs.* at 6 per cent. ? Ans. 5 years.

3. How long must a salary of 40*l.* per ann. be enjoyed for 245*l.* at 4 per cent. ? Ans. 7 years.

4. What time may a pension of 30*l.* per ann. be bought for 133*l.* 9*s.* 4d. 2 *qrs.* at 4½ per cent. ? Ans. 5 years.

Note. 1. If the payments are to be half-yearly, then U will be=half of the given lease, pension, &c. and R, will be= half of the ratio of the given rate, and T which is required, will be =to the number of payments or half-years.

2. If the payments are to be quarterly, then U will be=a fourth part of the given lease, pension, &c. and R will be= a fourth part of the ratio of the given rate, and T will be= the number of quarterly payments.

5. A lease of a house of 50*l.* per ann. payable half-yearly is sold for 262*l.* 10*s.* at 5 per cent. ; I demand the number of payments and the time to come ? Ans. 12 payments=6 years.

6. A lease of a house of 50*l.* per ann. payable quarterly, is sold for 263*l.* 18*s.* 9*d.* 3*qrs.* at 5 per cent. I demand the number of *payments*, and the time to come ? Ans. 24 payments=6 years.

OF ANNUITIES, LEASES, &c. TAKEN IN REVERSION.

Case 1.

Q. How do you find the present worth of an annuity, &c. in reversion?

A. Thus: first find the present worth of the yearly rent at the given rate, and for the time of its continuance: to which, there are given U, T, and R, to find P, which is thus discovered:

$$\frac{rtt-rt+2t}{2rt+2}\times u=p.$$

Secondly, find what principal being put to interest will amount to P, at the same rate, and for the time to come before the annuity, &c. commences; and that will be the present worth of the annuity, &c. in reversion: therefore let R be changed into A=the amount, and then there will be given A, R, and T, to find P, or the principal, which is thus discovered:

$$\frac{a}{tr+1}=p.$$

EXAMPLES.

1. What is the present worth of a lease of 30*l.* per ann. to continue 3 years, but is not to commence till the end of 4 years, allowing 4 per cent. to the purchaser? Ans. 77*l.* 7*s.* 7.4*d.*

2. I have the promise of a pension of 17*l.* per ann. for 7 years, but it does not commence till the end of 4 years? and I am willing to dispose of the same for present payment at the rate of 5 per cent.—I demand the present worth? Ans. 84*l.* 9*s.* 6*d.*

3. There is a legacy of 20*l.* per ann. for 8 years, left to a person of 16 years of age? the time of payment is to commence at the year of perfection, i. e. at 21 years? but he wanting a sum of money, is minded to sell the same at 4 per cent.—I demand the present worth? Ans. 115*l.* 3 0*d* 2.5 *qrs.*

4. A good natured gentleman being minded to bestow favour upon an unthankful wretch, settled upon him an income of 35*l.* per ann. for 12 years, to commence 5 years after such settlement; but he wanting money to follow his extravagancies, sold it at the rate of 10 per cent.—I demand how much he received for the present worth? Ans. 197 5*s.* 5*d.* 1.792*qr.*

Case 2.

Q. *How do* you find the yearly income of an annuity, &c. *in reversion*

Thus: First, find the amount of the present worth of yearly sum, at the given rate, and for the time before the ersion: to do which, there are given P, T, and R, to find hich is thus discovered:

$$ptr+p=a.$$

econdly, find what yearly rent being sold will produce A the present worth, at the same rate and for the time of its tinuance: and that will be the yearly sum required: refore, change A into P, and then there will be given, P, and T, to find U, or the yearly sum, thus:

$$\frac{rt+1}{rtt-rt+2t}\times 2p=u.$$

EXAMPLES.

There is a lease of a house taken for 3 years but comaces not till the end of 2 years? and the lessee would sell time for 77*l.* 7*s.* 7.4*d.* present payment, allowing 4 per t. to the purchaser? I demand the yearly rent? Ans. per annum.

2. I have the promise of a pension for 7 years, which ll not commence till the end of 4 years? and I have dised of the same for the present payment of 84*l.* 9*s.* 6*d.* owing 5 per cent. to the purchaser; I demand the yearly come? Ans. 17*l.*

3. There is a legacy of a certain rate per annum, for 8 ars, left to a person of 16 years of age; but the time of yment must not commence till the age of perfection; and e same person wanting a sum of money, sold it for 115*l.* 0*d*$\frac{1}{2}$. allowing 4 per cent. to the buyer; I demand the arly rate? Ans. 20*l.*

4. A good natured gentleman being minded to bestow a our upon an unthankful wretch, settled an income upon n for 12 years, at a certain rate per annum, to commence ears after such settlement; but he wanting money to folw his extravagance, sold it for 197*l.* 5*s.* 5*d.* 2*qrs.* allowing per cent. to the buyer for present payment; I demand e yearly value? Ans. 35*l.*

OF SIMPLE INTEREST FOR DAYS.

Q. How do you find the Simple Interest of any sum of oney for any number of days?

A. Multiply the interest of one pound for one day, at the ven rate, by the principal, and by the number of days; the st *product is the interest* required.

Note. The Interest of one pound for one day at

1	PER CENT.	is = .00002739726
2		is = .00005479452
3		is = .00008219178
4		is = .00010958904
5		is = .0001369863
6		is = .00016438356
7		is = .00019178082
8		is = .00021917808
9		is = .00024657534
10		is = .0002739726

EXAMPLES.

1. What is the interest of 120*l.* for 126 days, at cent. ? Ans. 1*l.* 13*s.* 1*d.* 2 *qrs* +

2. What is the interest of 128*l.* for 145 days, at cent. ? Ans. 3*l.* 0*s.* 0*d.* 3 *qrs.*+

3. What is the interest of 100*l.* from the 1st of 1781, to the 8th of March following at 5 per cent. ? A 16*s.* 11*d.* 3 *qrs.*

4. What is the interest of 200*l.* from the 14th of A 1781, to the 19th of December following, at 6 per c Ans. 4*l.* 4*s.* 1*d.* 3*qrs.*+

5. What is the interest of 10*l.* for 25 days, at 5 per c Ans. 8*d.*+

6. What is the interest of 40*l.* for 40 days, at 4 per c Ans, 3*s.* 6*d.*+

Note. there is another way of answering questions in in for days, which is laid down in case 1, in Simple Interest, 155, as appears by the eighth quesion in that case. The may use which he likes best, or both if he pleases.

OF REBATE OR DISCOUNT.

Q. What particular letters are used in Rebate ?

A. These :

S, the sum to be discounted.

P, the present worth of that sum due at any time to

T, the time before it becomes due.

R, the ratio, or the rate per cent.

Case 1.

Q. When S, T, and R, are given to find P, how is it disco

A. Thus: $\frac{s}{tr+1}=p$

EXAMPLES.

1. *What* is the present worth of 795*l.* 11*s.* 9*d.* *months,* at 6 per cent. ? Ans, 754*l.* 1*s.* 8*d.*+

2. What is the present worth of 161*l.* 10*s.* for 19 months 5 per cent. ? Ans. 149*l.* 13*s.* 1*d.*+

3. If a legacy of 1000*l.* is left me the 24th of July, 1781, be paid on the Christmas-Day following; what must I ceive when I allow 6 per cent. for present payment? Ans. 5*l.* 3*s.* 0*d.* 3 *qrs.*+

EXAMPLES.

Case 2.

Q. When P, T, and R, are given to find S, how is it dis-vered?

A. Thus: $ptr+p=s$.

1. Suppose I receive 754*l.* 1*s.* 8*d.* now, for a sum of mo-y. due 11 months hence, allowing 6 per cent. for present yment: I demand the sum that was due at first? Ans. 5*l.* 11*s.* 2*d.*

2. There is a certain debt payable 19 months hence; but gree with the debtor to pay me down 149*l.* 13*s.* 1*d.* and w him 5 per cent. for present payment; I demand how ch the debt is? Ans. 161*l.* 10*s.*

3. A legacy was left me the 24th of July, 1781, to be paid the Christmas-Day following, but I agree with the exe-tor, and allow him 6 per cent. for the present payment of 5*l.* 3*s.* 0*d.* 3*qrs.* I demand what the legacy was? Ans. 00*l.*

Case 3.

Q. When S, P, and R, are given to find T, how is it dis-vered?

A. Thus: $\frac{s-p}{rp}=t$.

EXAMPLES.

1. The present worth of 795*l.* 11*s.* 2*d.* due for a certain me to come, is 754*l.* 1*s.* 8*d.* at 6 per cent. I demand in at time the first sum shall have been paid, if no rebate d been made? Ans. 11 months.

2. There is 161*l.* 10*s.* due at a certain time to come, but llow 5 per cent. to the debtor, for the present payment of 9*l.* 13*s.* 1*d.* I demand when the sum should have been d without any rebate? Ans. 19 months.

3. I have received 975*l.* 3*s.* 0*d.* 3*qrs.* for a legacy of 1000*l.* owing the executors 6 per cent. I demand when the lega-was payable without rebate? Ans. 155 days.

Case 4.

Q. When S, P, and T, are given to find R, how is it dis-vered?

A. Thus: $\frac{s-p}{tp}=r$

EXAMPLES.

1. At what rate per cent. will 795*l.* 11*s.* 2*d.* p months hence, produce 754*l.* 1*s.* 8*d.* for the pres ment? Ans. 6 per cent.

2. At what rate per cent. will 161*l.* 10*s.* payable 1 hence, produce the present payment of 149*l.* 13*s.* 1 5 per cent.

3. Suppose a legacy of 1000*l.* is left me the 24t 1781, to be paid on the Christmas-day followin agree with the executor for the present payment of 0*d.* 3 *qrs.* I demand the rate per cent. allowed fo ney? Ans. 6 per cent.

OF EQUATION OF PAYMEN

THE TRUE WAY.

Q. How is the equated time for the payment of money due at several times found out?

A. Thus: 1. Find the present worth of each pa its respective time, as in rebate, that is,

$$\frac{s}{tr+1}=p.$$

2. Add all the present worths together, and call also P; then is $s-p=d$, the rebate.

3. $\frac{d}{pr}=e$, is the true equated time.

EXAMPLES.

1. A owes B 200*l.* to be paid as follows, viz. months; and 100*l.* at 4 months: but they agree to one payment of the whole, rebate being made at 6 I demand the true equated time? Ans. 3 months

2. A merchant hath owing to him 300*l.* to be p

end of 20 months ; and they agree to have but one payment of the whole, rebate at 3 per cent. I demand the true nated time ? Ans. 1 year, 11 days.

OF COMPOUND INTEREST.

Q. What particular letters are used here ?
A. These :
P, the principal.
T, the time ;
R, the amount of 1*l.* for 1 year, at any given rate ;
A, the whole amount.
Q. How is the amount of 1*l.* for 1 year at any proposed te per cent. found ?
A. Thus : As 100 : 106 :: 1 : 1.06.
100 : 105 :: 1 : 1.05.

A Table of the amounts of 1l. for 1 year.

Rates per Ct.	Amts.of 1*l.*	Rates per Ct.	Amts.of 1*l.*
2	1.02	6½	1.065
3	1.03	7	1.07
3½	1.035	7½	1.075
4	1.04	8	1.08
4½	1 045	8½	1.085
5	1.05	9	1.09
5½	1.055	9½	1.095
6	1.06	10	1.1

Case 1.

Q. When P,T, and R, are given to find A, how is it dis-vered ?
A. Thus : $p \times r^t = a$.
Note. R, must be involved so many times as the number of rs direct, and that will be r^t.

EXAMPLES.

1. What sum will 450*l.* amount to in 3 years time at 5 cent. per ann. ? Ans. 520*l.* 18*s.* 7*d.* 2*qrs.*
2. What will 400*l.* amount to in 4 years, at 6 per cent. ann ? Ans. 504*l.* 19*s.* 9*d.* 3.15264 *qrs.*
3. What will 480*l.* amount to in 6 years, at 5 per cent. per n. ? Ans. 643*l.* 4*s.* 11.0178*d.*
4. What is the amount of 500*l.* at 4½ per cent. per ann. 4 years ? *Ans.* 590*l.* 11*s.* 5*d.* 2.95+qrs.

Case 2.

Q. When A, R, and T, are given to find P, how is it covered?

A. Thus: $\frac{a}{r^t}=p$.

EXAMPLES.

1. What principal must be put to interest to amount to a sum of 520*l.* 18*s.* 7*d.* 2*qrs.* in 3 years, at 5 per cent. per ann.? Ans. 450*l.*

2. What principal will amount to 504*l.* 19*s.* 9*d.* 3.2 *qrs.* in 4 years, at 6 per cent. per ann.? Ans. 400*l.*

3. What principal will amount to 643*l.* 4*s.* 11.01764*d.* in 6 years, at 5 per cent. per ann.? Ans. 480*l.*

4. What principal will amount to 590*l.* 11*s.* 5*d.* 3*qrs.* in 4 years, at 4¼ per cent.? Ans. 500*l.*

Case 3.

Q. When P, R, and A, are given to find T, how is it covered?

Thus: $\frac{a}{p}=r^t$ { which being continually divided by r, till nothing remains, the number of those divisions will be $=t$.

EXAMPLES.

1. In what time will 450*l.* amount to 520*l.* 18*s.* 7*d.* 2 *qrs.* at 5 per cent. per ann.? Ans. 3 years.

2. In what time will 400*l.* amount to 504*l.* 19*s.* 9*d.* 3.2 *qrs.* at 6 per cent. per ann.? Ans. 4 years.

3. In what time will 480*l.* amount to 643*l.* 4*s.* 11.1*d.* at 5 per cent. per ann.? Ans. 6 years.

4. In what time will 500*l.* amount to 590*l.* 11*s.* 5*d.* 3 *qrs.* at 4¼ per cent. per ann.? Ans. 4 years.

Case 4.

Q. When P, A, and T, are given to find R, how is it covered?

A. Thus: $\frac{a}{p}=r^t$ { which must be extracted by the rule of extraction; the time given in the question $=t$ shewing the power.

EXAMPLES.

1. At what rate per cent. will 450*l.* amount to 520*l.* 18*s.* 7*d.* 2 *qrs.* in 3 years? Ans. 5 per cent.

2. At what rate per cent. will 400*l.* amount to 504*l.* 19*s.* 9*d.* 3.2 *qrs.* in 4 years? Ans. 6 per cent.

3. At what rate per cent. will 480*l.* amount to 643*l.* 4*s.* 11.1*d.* in 6 years? Ans. 5 per cent.

4. At what rate per cent. will 500*l.* amount to 590*l.* 11*s.* 5*d.* 3 *qrs.* in 4 years? Ans. 4¼ per cent.

ANNUITIES, OR PENSIONS, IN ARREARS

. U represents the Annuity, Pension, &c. T, R, and A, re.

Case 1.

When U, T, and R, are given to find A, how is it ered?

A. Thus $\frac{ur^t-u}{r-1}=a$

EXAMPLES.

What will an annuity of 30*l.* per ann. payable yearly to in 4 years, at 5 per cent.? Ans. 129*l.* 6*s.* 0*d.* 3.6*qrs.*

uppose a pension of 50*l.* per ann. payable yearly, be l to a superannuated officer; what is the amount for s forbearance, at 4 per cent.? Ans. 270*l.* 16*s.* 3*d.* *s.*

the yearly rent of a house which is 40*l.* be forborn at 6 per cent. what is the amount? Ans. 335*l.* 15*s.* $+qrs.$

a salary of 35*l.* per ann. to be paid yearly, be omitted ears at $5\frac{1}{2}$ per cent. what is the amount? Ans. 241*l.* 2.5$+qrs.$

Case 2.

When R, T, and A, are given to find U, how is it dis- l?

A. Thus: $\frac{ra-a}{r^t-1}=u.$

EXAMPLES.

hat annuity, being forborn for 4 years, will amount 6*s.* 1*d.* at 5 per cent.? Ans. 30*l.* per ann.

a pension being forborn for 5 years, at 4 per cent. . amounts to 270*l.* 16*s.* 4*d.* I demand how much it is .? Ans. 50*l.* per ann.

the yearly rent of a house, being forborn for 7 years, r cent. amounts to 335*l.* 15*s.* 0*d.* 3.4*qrs.* I demand e rent is? Ans. 40*l.* per ann.

the payment of a salary be omitted 6 years, I demand ich the salary is, when the amount is 241*l.* 1*s.* 7*d.* at $5\frac{1}{2}$ per cent.? Ans. 35*l.* per annum.

Case 3.

When U, A, and R, are given to find T, how is it ed?

s: $\frac{ra+u-a}{u}=r^t.$ { which being continually divided by r, till nothing remains, the number of those divisions will be $=r$.

EXAMPLES.

1. In what time will 30*l.* per ann. amount to 129*l.* 6 allowing 5 per cent. for the forbearance of payment? A years.

2. In what time will a pension of 50*l.* per ann. amo 270*l.* 16*s.* 4*d.* at 4 per cent? Ans. 5 years.

3. In what time will the yearly rent of a house bein per ann. amount to 336*l.* 15*s.* 1*d.* at 6 per cent for pay ment? Ans. 7 years.

4. In what time will a salary of 35*l.* per ann. amo 241*l.* 1*s.* 7*d.* 2.8*qrs.* at 5½ per cent for the forbearance o ment? Ans. 6 years.

Note. In this and the two next sections might be place 4; but because it requires an algebraic method of proce in order to find R, I omit inserting it in its place; this designed to treat only of numbers.

OF THE PRESENT WORTH OF ANNUITIES PENSIONS. &c.

Note. P, is the present worth—U, T, and R, as in the

Case 1.

Q. When U, T, and R, are given to find P, how is i covered?

A. Thus: $\frac{ur^t-u}{r^t\times(r-1)}=p$

EXAMPLES.

1. What is the yearly rent of 20*l.* to continue 6 worth in ready money, at 5 per cent.? Ans. 101*l.* 10*s.* 3

2. What is the present worth of a pension of 30*l.* pe for 5 years, at 4 per cent.? Ans. 133*l.* 11*s.* 1*d.*

3. What must be the discount of a lease of 50*l.* per when present payment is made for 4 years at 3 per Ans. 14*l.* 2*s.* 10*d.* 3*qrs.*

4. A house is let upon lease for 4 years at 70*l.* pe and the lessee is desirous to make present payment. pre the lessor would allow him 5¾ per cent. I demand how must be paid down and how much discounted?

Ans. { 243*l.* 19*s.* 0*d.* 2*qrs.* to be paid down.
{ 36 0 11 2*qrs.* to be discounted.

Case 2.

Q. When P, T and R are given to find U, how is i covered?

A. Thus: $\frac{pr^t\times r-1}{r^t-1}=u$

EXAMPLES.

1. What annuity or yearly rent, to continue 6 years, may be purchased for 101*l.* 10*s.* 3*d.* 3*qrs.* at 5 per cent.? Ans. 20*l.*

2. Suppose the present payment of 133*l.* 11*s.* 1*d.* were required for a pension for 5 years to come, at 4 per cent. what is that pension? Ans. 30*l.* per ann.

3. If the present payment of 185*l.* 17*s.* 1*d.* 2*qrs.* be made for the lease of a house, 4 years to come, at 3 per cent. what is the yearly rent? Ans. 50*l.* per ann.

4. If a house is let upon a lease for 4 years, and the lessee takes present payment of 243*l.* 19*s.* 0*d.* 3*qrs.* for that time at $5\frac{1}{4}$ per cent. what is the yearly rent of the house? Ans. 70*l.* per ann.

Case 3.

Q. When U, P and R, are given to find T, how is it discovered?

A. Thus: $\frac{u}{p+u-pr}=r^t$, which being continually divided by r, till nothing remains, the number of those divisions will be $=t$.

EXAMPLES.

1. How long may a lease of 20*l.* yearly rent be had for 101*l.* 10*s.* 3*d.* 3*qrs.* allowing 5 per cent. to the purchaser? Ans. 6 years.

2. I demand what time a lease of 30*l.* per ann. may be purchased for, when present payment of 133*l.* 11*s.* 1*d.* is made at 4 per cent.? Ans. 5 years.

3. If 185*l.* 17*s.* 1*d.* 2*qrs.* be paid down for a lease of 50*l.* per ann. at 3 per cent. how long is the lease purchased for? Ans. years.

4. A house is let upon lease, at 70*l.* per ann. and the lessee takes present payment of 243*l.* 19*s.* 0*d.* 3*qrs.* he being allowed $5\frac{1}{4}$ per cent. I demand how long the lease is purchased for? Ans. 4 years.

OF ANNUITIES, LEASES, &c. TAKEN IN REVERSION.

Case 1.

Q. How many operations are there in case 1?

A. Two.

Q. What is the first?

A. Find the present worth of the yearly sum at the given rate, and for the given time of its continuance; to do which there are given U, T and R, to find P.

Q. How is P discovered?

A. Thus: $\frac{ar^t - a}{r^t \times (r-1)} = p$.

Q. What is the second?

A. Find what principal being put to interest will am
to P, at the same rate, and for the time to come before th
nuity commences, and that will be the present worth o
annuity, &c. in reversion; therefore let P be change
A=the amount. and then there will be given A, R, and
to find P, or the principal.

Q. How is P discovered?

A. Thus: $\frac{a}{r^t} = p$.

EXAMPLES.

1. What is the present worth of the reversion of a l
20*l*. per ann. to continue 4 years, but not to commen
the end of two years, allowing 5 per cent. to the purc
Ans. 64*l*. 6*s*. 8*d*. $\frac{1}{2}$.

2. There is a lease of certain lands worth 22*l*. pe
which is yet in being 4 years, and the lessee is desir
take a lease in reversion for 7 years, to begin when t
lease shall be expired; I demand the present worth
said lease in reversion, allowing 5 per cent to the purc
Ans. 152*l*. 6*s*. 8*d*. $\frac{1}{2}$.

3. There is a house now building, which I have a
take a lease of for 8 years, but the house will not be f
within 2 years; I demand how much I must pay down
the yearly rent is 100*l*. and the landlord allows me
cent. on present payment? Ans. 622*l*. 9*s*. 7.2*d*.

Case 2.

Q. How many operations are there in case 2?

A. Two.

Q. What is the first?

A. Find the amount of the present worth of the
sum at the given rate, and for the time before the
commences, to do which there are given P, R and T to

Q. How is A discovered?

A. Thus: $pr^t = a$.

Q. What is the second?

A. Find what yearly rent being sold will produc
the present worth, at the same rate, and for the tim
continuance, and that will be the yearly sum required;
fore let A be changed into P, and then there will be
R and T to find U, or the yearly sum.

Q. How is U discovered?

A. Thus; $\frac{pr^t \times r - 1}{r^t - 1} = u$

EXAMPLES.

1. What annuity or yearly rent to be entered upon 2 years hence, and then to continue 4 years, may be purchased for 64*l.* 6*s.* 6*d.* ready money, at 5 per cent.? Ans. 20*l.*

2. There is a lease of certain lands in being for 4 years, and the lessee being minded to take a lease in reversion for 7 years, to begin when the old lease shall be expired, laid down 152*l.* 6*s.* 8*d.* 2*qrs.* I demand the yearly rent of the said lands, when allowance was made to the lessee, at 5 per cent.? Ans. 32*l.* per ann.

3. The present payment for the lease of a house is 622*l.* 9*s.* 7.2*d.* Now I have taken a lease in reversion for 8 years, which is to commence at the end of 2 years: I demand how much the yearly rent is, when for the said present payment I was allowed 4*l.* per cent? Ans. 100*l.* per ann.

Case 3.

Q. How many operations are there in case 3?

A. Two.

Q. What is the first?

A. Find the amount of the present worth of the yearly sum at the given rate, and for the time before the annuity, &c. commences; to do which there are given P, R, and T, to find A, as in Case 2.

Q. How is A discovered?

A. Thus: $pr^t = a$.

Q. What is the second operation?

A. Find what time the yearly rent given being sold for will produce A for the present worth, at the same rate, and that will be the time required: therefore change A into P, and then there will be given U, P, and R, to find T, as in Case 3, page 171.

Q. How is T discovered?

A. Thus: $\frac{u}{p + u - pr} = r^t$. { which being continually divided by r till nothing remains, the number of those divisions will be $= t$.

EXAMPLES.

1. The present worth of a certain lease in reversion is 64*l* 6*s.* 6*d.* the lease is 20*l.* per ann. and commences 2 years hence and the allowance to the purchaser is 5 per cent. I demand *the time of its continuance*? Ans. 4 years.

2. A certain man took a lease of some lands, for a time which by agreement was not to commence till the expiration of 4 years: the yearly rent was 32*l.* it was also agreed, that the purchaser should lay down 152*l.* 6*s.* 8*d.* $\frac{1}{2}$ and be allowed for his present pay 5 per cent. I demand the time that the lease was taken for? Ans. 7 years.

3. The present payment for the lease of a house is 622*l.* 9*s.* 7.2*d.* and the yearly rent is 100*l.* Now I have taken a lease in reversion, which is to commence at the end of two years, I demand the length of the lease, when I was allowed 4 per cent. for my money? Ans. 8 years.

OF PURCHASING REAL OR FREEHOLD ESTATES.

Q. What do you understand by a real or freehold estate.

A. Such as is bought to continue forever.

Note. U represents the yearly rent; R the amount of 1*l.* &c. and P the present worth.

Case 1.

Q. When U and R are given to find P, how is it discovered?

A. Thus: $\frac{u}{r-1}=p$.

EXAMPLES.

1. Suppose a freehold estate of 40*l.* per ann. is to be sold, what is it worth, allowing the buyer 5 per cent. for his money? Ans. 800*l.*

2. What is an estate of 290*l.* per ann. to continue forever, worth in present money, allowing 4 per cent. to the buyer? Ans. 7250*l.*

Case 2.

Q. When P and R are given to find U, how is it discovered?

A. Thus: $p \times \overline{r-1}=u$.

EXAMPLES.

1. If a freehold estate is bought for 800*l.* and the allowance of 5 per cent. is made to the buyer, I demand the yearly rent? Ans. 40*l.* per ann.

2. If an estate be sold for 7250*l.* present money, and 4 per cent. is allowed to the buyer for the same, I demand the yearly rent? Ans. 290*l.* per ann.

Case 3.

Q. When P and U are given to find R, how is it discovered?

Ans. Thus: $\frac{p+u}{p}=r$.

EXAMPLES.

1. If a real estate of 40*l.* per ann. be sold for 800*l.* I demand the rate per cent.? Ans. 5 per cent.

2. If a freehold estate of 290*l.* per ann. be bought for 7250*l* I demand the rate per cent. allowed? Ans. 4 per cent.

OF PURCHASING FREEHOLD ESTATES IN REVERSION.

Case 1.

Q. How many operations are there in case 1?

A. Two.

Q. What is the first?

A. Find the present worth of the yearly sum at the give rate, to do which there are given U and R to find P.

Q. How is P discovered?

A. Thus: $\frac{u}{r-1}=p.$

Q. What is the second operation?

A. Find what principal being put to interest will amou to P, at the same rate, and for the time to come before th estate commences, and that will be the present worth of th estate in reversion: therefore let P be changed into A=th amount, and then there will be given A, R and T to fin P=the principal.

Q. How is P discovered?

A. Thus: $\frac{a}{r^t}=p.$

EXAMPLES.

1. Suppose a freehold estate of 40*l.* per ann. to commenc 3 years hence, is to be sold, what is it worth, allowing th purchaser 5 per cent. for his prompt payment? Ans. 691 1*s.* 4*d.* 3*qrs.*+

2. What is an estate of 290*l.* per ann. to continue for ev but not to commence till the expiration of 4 years, worth present money, allowance being made at 4 per cent.? An 6197*l.* 6*s.* 7*d.* 1*qr.*+

Case 2.

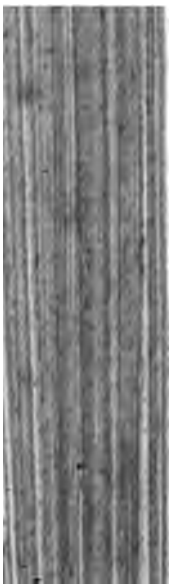
Q. How many operations are there in case 2?

A. Two.

Q. What is the first?

A. Find the amount of the present worth of the year rent, at the given rate, and for the time before the esta commences; to do which there are given P, T and R find A

Q.



1. Suppose a freehold estate, to comme
is sold for 691*l.* 1*s.* 5*d.* allowing to the pu
I demand the yearly income? Ans. 40*l.*

2. There is a certain freehold estate bo
7*d.* 1*qr.* which does not commence till t
years; the buyer was allowed 4 per cent.
demand the yearly income? Ans. 290*l.*

OF REBATE OR DISC

Q. What particular letters are used he
A. These:
S, the sum to be discounted for.
P, the present worth of that sum due at
T, the time before it becomes due, an
R, the amount of 1*l.* for 1 year, at any

Case 1.

Q. When S, T, and R, are given to fin
covered? A. Thus: $\frac{s}{r^t}=p.$

EXAMPLES.

1. What is the present worth of 520*l.*

EXAMPLES.

1. If 450*l.* be received for a debt, payable 3 years hence, and an allowance of 5 per cent. was made to the debtor for his present payment, I demand what the debt was? Answer, 520*l.* 18*s.* 7*d.* 2*qrs.*

2. There is a sum of money due at the expiration of 4 years, but the creditor agrees to take 400*l.* down, allowing 6 per cent. on present payment; I demand what the debt was? Ans. 504*l.* 19*s.* 9*d.* 3*qrs.*

3. If a sum of money, due 6 years hence, produces 480*l.* for the present payment, rebate being made at 5 per cent. I demand how much the debt was? Ans. 643*l.* 4*s.* 11*d.*

Case 3.

Q. When S, P and R are given to find T, how is it discovered?

1. Thus: $\frac{s}{p}=r^t$. { which being continually divided by r, till nothing remains, the number of those divisions will be $=t$.

EXAMPLES.

1. A certain man received 450*l.* down for a debt of 540*l.* 18*s.* 7*d.* 2*qrs.* rebate being made at 5 per cent. I demand in what time the debt was payable? Answer, 3 years.

2. There is a debt of 504*l.* 19*s.* 9*d.* 3*qrs.* payable at a certain time, but it is agreed to pay 400*l.* down at the allowance of 6 per cent. to the debtor for his present money; I demand in what time the debt will become due, if no such payment was to be made? Answer, 4 years.

3. The present payment of 480*l.* is made for a debt of 643*l.* 4*s.* 11*d.* rebate at 5 per cent. I demand when the debt was payable? Answer, 6 years.

Case 4.

Q. When S, P and T are given to find R, how is it discovered?

A. Thus: $\frac{s}{p}=r^t$. { which must be extracted by the rules of extraction; the time given in the question $=t$, showing the power.

EXAMPLES.

1. The present worth of 520*l.* 18*s.* 7*d.* 2*qrs.* payable 3 years hence, is 450*l.* I demand at what rate per cent. rebate is made? Answer, 5 per cent.

2. A debt of 504*l.* 19*s.* 9*d.* 3*qrs.* will be due 4 years hence, but it is agreed to take 400*l.* down; what is the rate per cent. that the rebate is made at? Answer, 6 per cent.

3. *The sum of* 643*l.* 4*s.* 11*d.* is payable in 6 years time,

end the present worth of that sum is 480*l.* I demand at what rate per cent. must rebate be made, to produce the said present worth? Ans. 5 per cent.

Note 1. Equation of Payments at compound interest, should follow next; but as that rule is best done by the Logarithms, the kind reader will, I hope, take this as a sufficient reason for not placing it here.

2. The whole business of compound interest is better performed by the Logarithms, or by tables calculated for that purpose, than otherwise; especially when the time given is very long, as for 20, 30, or 40 years, and when the payments are to be made half-yearly or quarterly. What is here done serves only for whole years, and shows what can be done by the pen, where the Logarithms or tables are wanting.

A practical and easy method to cast up the value of timber.

Rule—Multiply the number of feet by the price (in shillings) per load, and cut off three places to the right hand, which make pounds and decimal parts thereof.

EXAMPLES.

754 Feet at 1*l.* 7*s.* 6*d.* per load.

754 × 27 — 754 at 6*d.* = 377

20358 + 377 = 20.735 = 20 *l.* 14 *s.* 9¼ *d.*

856 Feet at 1*l.* 6*s.* per load.

Facit 42*l.* 5*s.* 1½*d.*

730 Feet at 1*l.* 8*s.* 6*d.* per load.

Facit 20*l.* 16*s.* 1*d.*

433 Feet at 1*l.* 3*s.* 6*d.* per load.

Facit 10*l.* 3*s.* 6*d.*

Demonstration—50 Feet make a load; therefore it is, as 50 feet . . Price in shillings : : Feet given . . Value in shillings, which ÷ 20 are pounds: but as 50 × 20 = 1000 which is a divisor for pounds: therefore the first figure being 1, and the rest ciphers, division is made at once, by pointing off three places as above.

PART IV.

A COLLECTION OF QUESTIONS

TO EXERCISE THE FOREGOING RULES.

1. WRITE down nine hundred millions, seven hundred sixty thousand, and twenty-one.

2. What must 20*s.* pay towards a tax, when 326*l.* 6*s.* 8*d.* is assessed at 41*l.* 16*s.* 2*d.* ? Ans. 2*s.* 6*d.* 2*qrs.* $\frac{77}{168}\frac{8}{21}\frac{0}{0}$.

3. If the $\frac{1}{3}$ of 6 be 3, what will the $\frac{1}{4}$ of 20 be ? Ans. $7\frac{1}{2}$.

4. I demand the sum of 1748 added to itself ? Ans. 3496.

5. I demand the product of 76 multiplied by itself ? Ans. 5776.

6. I demand the difference between 14676 and the fourth of itself ? Ans. 11007.

7. I demand the quotient of the square of 476 divided by the half of its root ? Ans. 952.

8. There is, in 3 bags, the sum of 1468*l.* viz. in the first bag 461*l.* in the second 581*l.* I demand what is in the third bag ? Answer, 426*l.*

9. What number is that which being multiplied by 13, the product will be 221 ? Answer, 17.

10. Two persons, A and B, owe several debts, the lesser debt, being that of A, is 2173*l.* the difference is 371*l.* what is the debt of B ? Answer, 2544*l.*

11. A captain and 160 sailors took a prize worth 1360*l.* of which the captain had $\frac{1}{2}$ for his share, and the rest was equally divided among the sailors; what was each man's part ? Answer, the captain had 272*l.* and each sailor had 6*l.* 16*s.*

12. An ancient lady being demanded how hold she was; to avoid a direct answer, said, I have 9 children, and there are 3 years between the birth of each of them; the eldest was born when I was 19 years old, which is now exactly the age of the youngest; how old was the lady ? Ans. 62 years old.

13. What number is that from which if you take 341 the remainder will be 726 ? Ans. 1067.

14. What number is that which being added to 168, makes the sum to be 706 ? Ans. 538.

15. What number is that which being divided by 19, the quotient will be 72 ? Answer, 1368.

16. *A broker* bought for his principal, in the year 1720,

400*l.* capital stock in the South sea, at 650 per cent. and sold it again when it was worth but 130 per cent. how much was lost in the whole? Answer, 2080*l.*

17. The sum of two numbers is 4139, their difference is 948; what is the lesser number? Ans. 3191.

18. A gentleman went to sea at 17 years of age; 8 years after that he had a son born, who lived 46 years, and died before his father; after whom the father lived twice 20 years, and then died also; I demand the age of the father when he died? Answer, 111 years.

19. Three gardeners, A, B and C, having bought a piece of ground, find the profits of it amount to 120*l.* per annum. Now the sum of money which they laid down was in such proportion, that as often as A paid 5*l.* B paid 7*l.* and as often as B paid 4*l.* C paid 6*l.* I demand how much each man must have per ann. of the gain?

B	A	B	A		*l.*	*s.*	*d.*
7 :	5 ::	4 :	$2\frac{4}{7}$	Ans. A	26	13	4
A	C	A	C	B	37	6	8
$2\frac{4}{7}$:	6 ::	5 :	$10\frac{1}{2}$	C	56	0	0
					120	0	0

20. A, B and C freight a ship with wine, viz. A lays out 1342*l.* B 1178*l.* C 630*l.* the whole 212 tons, are sold at 32*l.* per ton; what shall each man receive?

Ans. A 2890*l.* 3*s.* 11*d.* $3\frac{132}{315}$. *qrs.*
B 2537 $\frac{2}{315}$
C 1356 16 0

21. A, B and C made up a stock of 1000*l.* whereof A put in 409*l.* B 198*l.* and they improved it to 1964*l.* I demand what was the stock of C, and what was each man's share of the whole gain?

	l.	*s.*	*d.*
Ans. C's stock was	393	0	0
A's share was	803	5	$6\frac{240}{1000}$.
B's - - - - -	388	17	$5\frac{280}{1000}$.
C's - - - - -	771	17	$0\frac{480}{1000}$.

22. A, B and C freighted a ship for the Canaries, worth 3696*l.* whereof A puts in 369*l.* B 897*l.* but by reason of a storm, one third of the goods were cast overboard; I demand each man's share of the loss? Ans. A's loss was 123*l.* 299*l.* and C's 810*l.*

23. A and B traded together, and gained 140*l.* A put in 840*l.* B put in so much that he must receive 60*l.* of the gain. I demand how much B put in? Ans. 960*l.*

What is the value of 27 dozen, and 10*lb.* of candles, at
er lb. ? Ans. 6*l.* 19*s.* 2*d.*

Bought 28 qrs. 2 bushels of wheat, at 4*s.* 6*d.* per bush.
is the worth of it ? Ans. 50*l.* 17*s.*

If a man earns 2*s.* 6*d.* 2*qrs.* per day, how much is that for
eks, Sundays excepted ? Ans. 14*l.* 9*s.* 9*d.*

A, B and C traded together, the first laid in I know not
uch, B put in 20 pieces of cloth, and C put in 500*l.* and
ained 1000*l.* whereof A ought to have 350*l.* and B. 400*l.*
and C's share, how much the first man laid in, and what
pieces of cloth were worth ? Ans. C's, was 250*l.* A laid
l. and B's cloth was worth 800*l.*

A merchant buys up six bags of Canterbury hops, No. 1,
ich weighed 3*C.* 3*qrs.* 20*lb.* No. 2, 3*C.* 2*qrs.* 26*lb.* No. 3,
rs. 24*lb.* No. 4, 3*C.* 3*qrs.* only. No. 5, 2*C.* 2*qrs.* 22*lb.*
, 2*C.* 2*qrs.* 26*lb.* besides 5 pockets, 3 of which weighed
$\frac{3}{4}$ each, and the other two 62*lb.* $\frac{1}{4}$ each, how many Cwt.
e to pay carriage for ? Ans. 23*C.* 0*qrs.* 24$\frac{3}{4}$*lb.*

How many ducats must I deliver at Venice, to receive at
on 178*l.* 2*s.* the exchange being at 4*s.* 4*d.* per ducat ?
822 ducats.

A traveller would change 500 French crowns, at 4*s.* 6*d.*
rown, into sterling money but he must pay a half-penny
rown, for change ; how much must he receive ? Ans.
9*s.* 2*d.*

When a factor taketh 1*l.* per cent. for his commission, what
he have for 743*l.* 17*s.* 3*d.* ? Ans. 7*l.* 8*s.* 9*d.* 1*qr.* $1\frac{3}{10}$.

Two merchants in company gained 100*l.* A laid in so
, that for his share of the gain he must have 60*l.* B laid in
ducats, at 6*s.* 8*d.* per ducat ; I demand how much A laid
nd what the ducats were worth ? Ans. A laid in 360*l.* and
ucats were worth 240*l.*

There were two merchants who traded in company ; the
laid in the sum of 640*l.* and took $\frac{5}{8}$ of the gain, I demand
much the second merchant laid in ? Ans. 384*l.*

What number is that, which being multiplied by 15, the
uct will be $\frac{3}{4}$? Ans. $\frac{1}{20}$.

I demand the $\frac{1}{8}$ of 20*s.* ? Ans. 12*s.* 6*d.*

What fraction is that to which if you add $\frac{1}{3}$ the sum
be $\frac{5}{6}$? Ans. $\frac{1}{2}\frac{3}{6}$.

What number is that to which if you add 7$\frac{2}{3}$, the whole
be 12$\frac{1}{4}$? Ans. 4$\frac{7}{12}$.

What number is that from which if you take $\frac{3}{4}$, the
inder will be $\frac{1}{8}$? Ans. $\frac{7}{8}$.

What number is that from which if you take 13$\frac{1}{2}$, the
inder will be 5$\frac{1}{4}$? Ans. 19$\frac{3}{4}$.

40. What number is that, which being divided by $\frac{3}{4}$ quotient will be 21 ? Ans. $15\frac{3}{4}$.

41. What number is that, which being multiplied b produceth $\frac{1}{4}$? Ans. $\frac{3}{4}$.

42. What number is that, from which if you take $\frac{1}{3}$ self, remainder will be 12 ? Ans. 20.

43. What part of 25 is $\frac{4}{5}$ of an unit ? Ans. $\frac{1}{25}$.

44. What number is that, to which if you add its o the whole shall be 20 ? Ans. 12.

45. What number is that, which maketh 9 to be th it ? Ans. $13\frac{1}{2}$.

46. If a cannon may be discharged at twice with 6*lb.* of der, how many times will 7*C.* 3*qrs.* 17*lb.* discharge the piece ? Ans. 295 times.

47. If $\frac{3}{4}$ of a ship be worth 3740*l.* what is the whole w Ans. 9973*l.* 6*s.* 8*d.*

48. A young man received 210*l.* which was $\frac{2}{3}$ of his brother's portion ; now three times the elder brother's p was half of the father's estate ; I demand how much the was ? Ans. 1890*l.*

49. A factor bought a certain quantity of broad-clot drugget, which together cost him 81*l.* the quantity of cloth that he bought was 50 yards, at 18*s.* per yard, and f ery 5 yards of broad-cloth he had 9 yards of drugget ; mand how many yards of drugget he had, and how mu drugget cost him per yard ? Ans. 90 yards of drugget, per yard.

50. A certain usurer lent out 90*l.* for 12 months, and r ed principal and interest 95*l.* 8*s.* I demand at what ra cent. he received interest ? Ans. 6*l.* per cent.

51. Two men depart both from one place, the one goes and the other south ; the one goes 7 miles a day, and the 11 miles a day ; how far are they distant the 12th day their departure ? Ans. 216 miles.

52. A merchant bought 8 tons of wine, which having r ed damage, he sold for 400*l.* and 12 per cent. loss ; I d how much it cost him per tun, and how he sold it per gal lose after the said rate ?

Ans. { Cost 56*l.* 16*s.* $4d\frac{1}{4}+\frac{5}{11}$ per tun. Sold at 0*l.* 3*s.* 11*d.* 2*qrs.* $\frac{1}{2}\frac{3}{5}\frac{2}{2}$ per gallon

53. Two men depart both from one place, and both same road ; the one travels 12 miles every day, the ot miles every day ; how far are they distant the 10th da their departure ? Ans. 50 miles.

54. If a gentleman hath an estate of 1000*l.* per an *much* may he spend one day with another, to lay up thre *guineas* at the year's end ? Ans. 2*l.* 11*s.* 4*d.* $\frac{43}{365}$.

5. 76*lb.* of cinnamon cost 40*l.* 10*s.* 8*d.* and 1*C.* wt. of megs 59*l.* 14*s.* 8*d.* I demand the price of 3*oz.* one with ther? Ans. 2*s.*

6. A grocer delivered 17C. 3*qrs.* 10*lb.* of tobacco in the to be cut and dried, and when it came home it held out . 0*qrs.* 14*lb.* I demand how much was lost in every *lb.*? and supposing it cost in the roll 8*d.*$\frac{2}{7}$ per *lb.* and the cutting $\frac{1}{4}$ per *lb.* I demand what it now stands him in?

Ans. { Lost per *lb.* 1*oz.* 8*dr.*$\frac{1344}{1792}$.
{ It stands him in 87*l.* 5*s.* 3*d.* 1*qr.*$\frac{12}{56}$.

7. If tallow be sold for 4*d.* per *lb.* what is the value of 3 s, each 3*C.* 1*qr.* 10*lb.* gross, tare per tub 25*lb.*? Ans. 17*l.* 9*s.*

8. Shipped from Spain 10 tuns of wine at 10*l.* sterling per paid custom at the port of London 1*s.* per gallon; the ges for lighterage, cartage, and porterage, amounted to 5*l.* rwards by the misfortune of a pipe staving, containing 126 lons, I lost 59 gallons, the next day 28 gallons more run out, the remainder of the pipe not being saleable, I threw it y. The market price not running high, I sold the rest for per hhd. I demand how much I gained or lost by the sale e said wine? Ans. gained 115*l.*

9. A ship's company took a prize of 300*l.* which is to be ded among them as parties, according only to their pay and ime they have been on board; the officers and midshipmen nths, and the sailors 3 months. The officers one with anothhad 40*s.* per month; the midshipmen 30*s.* per month, and sailors 22*s.* There were 6 officers, 12 midshipmen, 84 ors; what must each party have of the prize, and what each gle person?

		l.	*s.*	*d.*			*l.*	*s.*	*d. qrs*
Ans.	The officers	42	2	8$\frac{1}{4}$	$\frac{3744}{8544}$	each man.	7	0	5$\frac{1}{4}$+
	Midshipmen	63	4	0$\frac{1}{2}$	$\frac{1344}{8544}$		5	5	4+
	Sailors	194	13	3	$\frac{864}{8544}$		2	1	7+

10. If 1000*lb.* of beef serve 240 men 8 days, how many *lb.* l serve 460 men 10 weeks? Ans. 16770*lb.* 13*oz.*$\frac{80}{240}$.

11. What is the amount of 1000*l.* for 5 years and an half at per cent. simple interest? Ans. 1281*l.* 5*s.*

12. Sold goods amounting to the value of 700*l.* for two 4 nths; what is the present worth at 5 per cent. simple inter-? Ans. 682*l.* 19*s.* 5*d.* 1*qr.*$\frac{177}{1809}$.

13. A merchant bought 400 cloths, at 12*l.* per cloth, which shipped for Spain, to have returns from thence the one half wine, at 30*l.* per tun, and the other half in rice, at 28*s.* per *t.* I demand how much of each must be returned for the th? Ans. 80 tuns of wine, and 1714*C.* 1*qr.* 4*lb.* of rice.

14. A tobacconist hath several sorts of tobacco, viz. of 12*d.* r *lb.* of 16*d.* per *lb.* of 18*d.* per *lb.* and of 2*s.* per *lb.* and he is irous to make a mixture of an *C.* wt. worth 20*d.* per *lb.* I de*ud how much of* each must be taken?

	lb.	*oz.*		*d.* per *lb.*
Ans.	17	$3\frac{1}{16}$	at	12
	17	$3\frac{1}{16}$	at	16
	17	$3\frac{1}{16}$	at	18
	60	$4\frac{1}{16}$	at	24

65. A brewer mixed 17 gallons of ale, at 8*d.* per gall with 19 gallons at 10*d.* per gallon, and with 40 gallons, 6*d.* per gallon. I demand what 1 gallon of this mixture worth; and also the worth of the whole quantity?

Ans. { 0*l.* 0*s.* 7*d.* 1*qr.*$\frac{8}{16}$ per gallon.
2*l.* 7*s.* 2*d.* the price of the whole mixture.

66. There are two numbers, the one 48, the other tw as much; I demand the difference between their sum a difference? Ans. 96.

67. There are two numbers, the one 63, the other h as much: I demand the product of their squares, and t difference of their product and sum?

Ans. { Product of the squares, 3938240.25
Difference, - - - 1890.

68. There are two numbers, the one 25, the other square of 25; I demand the square root of the sum of the squares? Ans. 625.4998+.

69. There are two numbers, whose product is 1058, multiplicand 46; I demand the multiplier, the sum of th factors, and the difference between the sum of the cube the factors, and the square of the product?

Ans. { Multiplier - - - - 23
Sum of the factors - - - 69
Difference - - - 1009861

70. There are two numbers, whose dividend is 1216, the quotient 76; I demand the divisor; the difference tween the cube of the quotient and the sum of the squ of the divisor and dividend; and the cube root of the of the cubes of the divisor, dividend, and quotient?

Ans. { Divisor - - - - - 16
Difference - - - - 1039936
Cube root - - - - - 1216+

71. Two men set out at the same time from the place, but go contrary ways, and they travel each of 34 miles a-day: I demand the time in which they will travelled 2000 miles? Ans. 29 days, 9 hours, 52 min.

72. *Six* rogues, viz. A, B, C, D, E, and F, having en

onfederacy, do agree to divide whatever sums of mo-
y shall at any time take upon the highways, accord-
heir valour, that is, in proportion to the number of
ey should then have on their faces: now the first two,
ınd B, being very bold and daring fellows, had receiv-
ı and B 19 scars. The next two, viz. C and D, hav-
ıs share of courage, and not caring to stand all brunts,
h of them but 9 scars; but the other two, viz. E and
g mere cowards, always turned their backs at the least
on, and so by chance they had one a-piece; and they
ıt several times stolen the sum of 700*l.* 13*s.* do de-
know how they must divide it?

A must have - - - -	237*l.*	10*s.*	2*d.*	0 $\frac{8}{9}$*qrs.*
B - - - - - - - - -	225	12	7	3 $\frac{33}{99}$
C - - - - - - - - -	106	17	6	3 $\frac{33}{99}$
D - - - - - - - - -	106	17	6	3 $\frac{33}{99}$
E - - - - - - - - -	11	17	6	0 $\frac{44}{99}$
F - - - - - - - - -	11	17	6	0 $\frac{44}{99}$

'here are three numbers, 17, 19, and 48; I demand the
:e between the sum of the squares of the first and last,
cube of the middlemost? Ans. 4266.

ı 7 cheeses, each weighing 1*C.* 2*qrs.* 5*lb.* how many
:es for seamen may be cut, each weighing 5*oz.* 7*dr.*?
63$\frac{2}{8}\frac{5}{7}$ allowances.

n 81034 rundrets of brandy, each 18 gallons, how
oss of bottles, each $\frac{1}{3}$ of a quart? Ans. 45581 gross,
, 6 bottles.

a 731 dozen bottles of wine, each 1$\frac{3}{4}$ pint, how many
ds? Ans. 29hhds. 52galls. 5pts. $\frac{4}{7}$.

old 8*C.* $\frac{1}{2}$ of steel, at 12*d.* per *lb.* how much Flemish
ıt 33*s.* 8*d.* per pound sterling, am I to receive for
e? Ans. 80*l.* 2*s.* 6*d.* $\frac{9}{24}\frac{5}{0}$ Flemish.

: 48 taken from 120 leave 72, and 72 taken from 91
), and 7 taken from thence leaves 12; what number
ɔut of which when you have taken 48, 73, 19, and 7,
2? Ans. 158.

, hath $\frac{1}{2}$ of a ship, B, $\frac{1}{4}$, C, $\frac{1}{16}$, D, $\frac{3}{10}$: the master
20*l.* how much must each owner have?

Ans.

A must have - - - -	60*l.*	0*s.*
B - - - - - - - - -	30	0
C - - - - - - - - -	7	10
D. - - - - - - - - -	22	10

gentleman having 50*s.* to pay among his labourers for
work, would give to every boy 6*d.* to every woman
to every man 16*d.* the number of boys, women

and men, were the same; I demand the number of each? A
20 of each sort.

81. A gentleman had 7*l.* 17*s.* 6*d.* to pay among his labo
ers; to every boy he gave 6*d.* to every woman 8*d.* and to ev
man 16*d.* and there were for every boy three women, and
every women two men; I demand the number of each? A
15 boys, 45 women, 90 men.

82. Admit a tax of 39*l.* is laid on a town for the building o
bridge, and the value of the town rent is 900*l.* per annum, w
shall a man pay towards it whose income is worth 100*l.* per
num? Ans. 4*l.* 6*s.* 8*d.*

83. Suppose A hath an estate of 53*l.* per annum, pay
10*d.* to a subsidy; what shall B pay, whose estate is worth
per annum? Ans. 11*s.* 0*d.* $\frac{4}{53}$.

84. If 136*l.* are to be divided between two men, so as the
ser share may have such proportion to the greater as 2
what must each man have?

Ans. { One must have - 38*l.* 17*s.* 1*d.* $2\frac{2}{3}$*qrs.*
{ The other - - - 97 2 10 $1\frac{1}{3}$

85. There are 1000*l.* to be divided among three men, in
a manner, that if A have 3*l.* B shall have 5*l.* and C 8*l.*
much must each man have?

Ans. { A must have - - - - - - - - 187*l.* 10*s.*
{ B - - - - - - - - - - - - 312 10
{ C - - - - - - - - - - - - 500 0

86. Shipped from Jamaica 550 pair of stockings, at 11*s.* 6
per pair, and 460 yards of stuff, at 14*d.* per yard; in return
which I had 46C. 3*qrs.* of sugar, at 24*s.* 6*d.* per C. and 157
of indigo, at 2*s.* 4*d.* per *lb.* what remains due to me of my
venture? Ans. 102*l.* 12*s.* $11\frac{1}{2}$*d.*

87. If one pound ten, and forty groats
Will buy a load of hay;
How many pounds with nineteen crowns
For twenty loads will pay? Ans. 38*l.* 11*s.*

88. A man driving his geese to the market, was met by
other, who said good-morrow, master with your hundred ge
Says he, I have not an hundred: but if I had half as many
now have, and two geese and an half, beside the number I h
already, I should have an hundred. How many had he?
65.

89. If a tower 384 feet high from the foundation, and a s
part be under the earth, and an eighth part under the water;
much in height is visible? Ans. 272 feet.

90. A merchant would lay out in spices 560*l.* at the
lowing prices, viz. cloves at 4*s.* per *lb.* mace at 7*s.* cinn
at 3*s.* nutmegs at 12*s.* and pepper at 2*s.* per *lb.* and he w

e an equal quantity of each sort. I demand that quantity ?
: 400*lb.* of each sort.

. The computed distance between London and York is
) miles ; now if a man sets out from London and walks eve-
day towards York 20 miles, and back again towards London
miles ; how long will it be before he gets to his journey's
? Ans. 30 days.

2. Bought 127 pieces of cloth, for which I delivered 3589
of holland, at 7*s.* 11*d.* per ell English, what cost a piece of
cloth ? Ans. 11*l.* 3*s.* 8*d.* $2qrs.\frac{2}{12}\frac{4}{7}$.

3. The account of a certain school is as follows, viz. $\frac{1}{16}$ of
boys learn geometry, $\frac{1}{4}$ learn grammar, $\frac{3}{16}$ learn arith-
ic, $\frac{2}{20}$ learn to write, and 9 learn to read ; I demand the
ber of each ? Ans. 5 geometers, 30 grammarians, 24
metricians, 12 writers, and 9 readers.

. I have laid out for a merchant 638*l.* 17*s.* 3*d.* he allows
$\frac{3}{4}$ per cent. before that I owed him 184*l.* 17*s.* 9*d.* how
h is he indebted to me ? Ans. 471*l.* 10*s.* 10*d.* 2*qrs.*

5. Bought a tun of wine for 78*l.* 17*s.* at what price must I
it per quart to gain 5*l.* 10*s.* by the whole, when there were
gallons leaked out ? Ans. 22*d.*+

6. If out of 10*s.* per week I lay up 4*d.* 2*qr.* per day, Sun-
s excepted ; and have saved 9*l.* 2*s.* 3*d.* how long was I in
ng it up ; and how much have I spent in that time ?

Ans. { 567 days in laying up.
{ 31*l.* 7*s.* 9*d.* spent.

7. If I buy 1000 ells Flemish of linen for 90*l.* what may I
it per ell in London, to gain 10*l.* by the whole ? Ans. 3*s.*
per ell.

8. Bought threescore pieces of holland for three times as
ıy pounds, and sold them again for four times as much; but
ıey had cost me as much as I sold them for, what should I
e sold them for, to gain after the same rate ? Ans. 320*l.*

9. There are three quantities of silver each of the same
ight, but different in value : the weight of each quantity is
oz. the value of the first sort is 4*s.* per oz. of the second 4*s.*
per oz. and of the third 5*s.* per oz. I demand the worth of
oz. when they are all melted down together ? Ans. 4*s.* 6*d.*
oz.

00. I have received advice from my factor, that he has dis-
sed upon my account the sum of 4000 guilders, 15 stivers ;
:mand what sum I must answer for that in english money,
hange at par : and also what his commission comes to at
er cent.

Ans. { 375*l.* 1*s.* 4*d.*$\frac{1}{8}\frac{4}{5}$ sterling.
{ 7*l.* 10*s.* 0*d.* $\frac{1}{4}$+commission.

Now suppose the tare or weight of every
empty, to be 38*lb*. I demand the neat weigh
I also demand the prime cost of the same,
to 18*s*. per *C*. including the charges of ligh
warehouse-room, custom, &c. Also I de
gain; and the gain per cent. supposing the
were sold afterwards at 28*s*. per cwt. and the
viz. C and D, at 4*d*. per *lb*.

		l.
Ans.	Prime cost - - - - -	42
	Whole gain - - - - -	34
	Gain per cent. - -	82

103. A gentleman a chaise did buy,
A horse and harness too;
They cost the sum of threescore po
Upon my word 'tis true.
The harness came to half of th' hor
The horse twice of the chaise ;
And if you find the price of them,
Take them and go your ways.

Ans.	Chaise - - - - -	15*l*.
	Horse - - - - -	30
	Harness - - - -	15

104. A gentleman courted a young lady, s

, and of their death : also the reason why the lady's
ch was continually gaining upon her husband's,
otwithstanding be never able to overtake it ?

HORT COLLECTION OF PLEASANT AND DIVERTING QUESTIONS.

eral having a castle, situate on a square, and garrisoned by 48 soldiers, so
m, as that any two corners, and the side between them, should consist of 16
e thinking there were not men enough, hired 8 more, but still kept up the
er of 16 men as before; afterwards 16 men were paid off, he not having oc-
them; but yet he kept up his number of 16 men. I demand how he must
ld men, to make 16 every way, when he had 48, 56, and 40 soldiers ?
r woman carrying some eggs to market, met with a rude fellow who broke
ut presently after, considering what he had done, went back and told the
was willing to make satisfaction, provided she could tell how many there
answered, she could not tell, but the best account that she could give, was,
he told them in by two at a time, there was one left, when by three, there
t, and when by four, there was one left; but when she told them in by five
none left. I demand how many eggs the woman had ?
tleman's servant went to market with an order to buy 20 fowls for 20*d.* he did
ought home pigeons at 4*d.* a piece, larks at a half-penny a piece, and spar-
rthing a piece. I demand how many there were of each sort ?
se the 9 digits to be placed in a quadrangular form; I demand in what order
stand, that any three figures in a right line may make just 15 ?
be set down in 4 figures, and let each figure be the same.
ntryman having a fox, a goose, and a peck of corn, in his journey came to
here it so happened that he could carry but one over at a time. Now as no
o be left together that might destroy each other; so he was at his wits end
ose of them: For says he, though the corn can't eat the goose, nor the
e fox, yet the fox can eat the goose and the goose can eat the corn. The
, how he must carry them over that they might not devour each other.
jealous husbands with their wives, being ready to pass by night over a river,
ne water-side, a boat which can carry but two persons at once, and for want
ean, they are necessitated to row themselves over the river at several times:
u is, how these 6 persons shall pass by 2 and 2, that none of the three wives
nd in the company of 1 or 2 men unless her husband be present ? Wingate.
merry companions are to have equal shares of 8 gallons of wine, which are
containing exactly 8 gallons: now to divide it equally between them, they
wo other empty vessels, of which one contains 5 gallons, and the other, 3:
n is, how they shall divide the said wine between them by the help of these
o that they may have 4 gallons a piece ? Wingate.
ack to his brother Harry, I can place four three's in such a manner that
make just 31; can you do so too ?

PART V.

OF DUODECIMALS.

Q. What are Duodecimals?

A. They are fractions of a foot, or of an inch, or any of an inch, having 12 for their denominators.

NOTATION OF DUODECIMALS.

Q. How do you write Duodecimals?

A. Thus: 3 7 2 3

Q. How do you read them?

A. Thus: 3 feet, 7 inches, 2 seconds, 3 thirds, or fourths, &c.

Note 1. Some call the inches primes, and mark them

2. Though this manner of dividing and subdividing endless, yet it is only so in imagination, and cannot be to practice, because a second, or the twelfth part of an o small as to be incapable of any further division.

ADDITION OF DUODECIMALS.

Note. 12 Fourths make - - - 1 Third.
12 Thirds - - - - - - - 1 Second.
12 Seconds - - - - - - 1 Inch.
12 Inches - - - - - - 1 Foot.

EXAMPLES.

F.	I.	″.	‴.	⁗.
14	4	3	6	6
17	10	11	10	4
16	3	7	5	1
10	1	10	11	11
10	3	6	7	11
46	4	9	10	6

F.	I.	″.	‴.	⁗.
28	4	3	7	10
36	10	3	11	5
19	10	4	7	7
30	6	6	9	4
47	6	2	10	11
92	11	10	5	7

A joiner having finished several very curious piec workmanship, would know the content of the whole. the first piece measured seventeen feet, ten inches, tw conds, and one third; the second measured twenty feet, inches, and seven thirds; the third forty-nine feet six in

ine seconds; the fourth fourscore feet and ten seconds; fth seventeen feet, and four thirds: the sixth threescore nd ten seconds; and the seventh thirty-seven feet, and thirds. What was the content in square measure?

SUBTRACTION OF DUODECIMALS.

EXAMPLES.

	F.	*I.*	″.	‴.	⁗.		*F.*	*I.*	″.	‴.	⁗.
From	74	3	4	7	6		100	5	7	3	1
Take	19	4	1	8	10		97	8	9	10	11

joiner having lined several rooms very curiously with , finds the amount to be, in square measure, 800*f.* 3*i.* 4″. everal deductions being to be made for windows, arches, those deductions amounted to 70*f.* 3*i.* 7″, 10‴, 5⁗. many feet of workmanship must he be paid for?

MULTIPLICATION OF DUODECIMALS.

OMMONLY CALLED CROSS MULTIPLICATION.

Note. Feet multiplied by feet give feet,
Feet multiplied by inches give inches,
Feet multiplied by seconds give seconds,
Inches multiplied by inches give seconds,
Inches multiplied by seconds give thirds,
Seconds multiplied by seconds give fourths, &c.

EXAMPLES. 1. OF FEET AND INCHES.

	F.	*I.*	
iply	7	3	
	4	7	
	29	0	″
	4	2	9
uct	33	2	9

1. Here I multiply the 7*f.* 3*i.* first by 4 feet (which give feet and inches for the product) saying 4 times 3 is 12, set down 0 and carry 1; then 4 times 7 is 28 and 1 is 29, which set down.

2. Next I multiply the same 7*f.* 3*i.* by 7 inches (which give inches and seconds for the product) saying 7 times 3 is 21, set down 9 seconds and carry 1 inch; then 7 times 7 is 49 and 1 is 50 inches, or 4 feet, 2 inches, which set down; then add them together, and the whole is 33*f.* 2*in.* 9*sec.*

	F.	*I.*		*F.*	*I.*		*F.*	*I.*		*F.*	*I.*
iply	7	5		4	6		9	7		8	3
	3	9		5	8		9	7		6	4
uct	27	9	9	25	6	.91	10	1		52	3

	F.	I.		F.	I.		F.	I.	
Multiply	4	7		3	8		9	7	
By	5	10		7	6		3	6	
Product	26	8	10	27	6		33	6	6
	F.	I.		F.	I.		F.	I.	
Multiply	3	11		6	5		7	10	
By	9	5		7	6		8	11	
Product	36	10	7	48	1	6	69	10	2

The truth of any one of these operations may be pro by reducing the factors into inches, and dividing their p duct by 144, the number of square inches in a foot sq the quotient will be the answer, viz.

First Sum.

1. *By whole numbers.*

F. I.
7 3 = 87
4 7 = 55

435
435

144)4785(33
432

465
432

33
12

144)396(2
288

108
12

144)1296(9
1296

0

2. *By Vulgar Fractions.*

F.
Multiply 7 $\frac{3}{12}$
By 4 $\frac{7}{12}$
87 55 4785
—×—=——
12 12 144

Then divide the numerator by the denominator, as before.

3. *By Decimals.*

Multiply 4.58
By 7.5

229[illegible]
916[illegible]
320[illegible]

33.228925
12

2.747100
12

8.9662

F. I. "
Facit 33 2 9 nearly.

. When the number of feet happens to be large in either of the factors, instead of multiplying by inches (if any may take parts with them.

EXAMPLES.

	F.	I.		F.	I.		F.	I.
ly	76	7		46	7		71	7
	48	9		39	8		84	6
=	608			1847	9	8	6048	9 6
=	304							
=	82	".		F.	I.		F.	I.
	38	3 6		76	7		36	1
	19	1 9		19	10		18	8
ct	3733	5 3		1518	10	10	672	0 8
	F.	I.		F.	I.		F.	I.
ly	84	3		48	7		79	8
	95	2		26	8		38	11
ct	8017	9 6		1295	6	8	3100	4 4
	F.	I.		F.	I.		F.	I.
ly	127	6		767	5		7691	10
	184	8		198	3		1976	11
ct	23545	0		152140	4	3	15206113	6 2

2. OF FEET, INCHES, AND SECONDS.

	F.	I.	"		F.	I.	"		F.	I.	"
ly	7	3	2		8	6	9		3	10	6
	1	7	3		7	3	8		7	4	8
	7	3	2	'''	62	5	7	9	28	7	7
	4	2	10	2 ''''							
		1	9	9 6							
ct	11	7	9	11 6							

.	"		F.	I.	"		F.	I.	"
	9		3	8	4		9	8	7
:	9		3	9	2		12	3	10
!	9	3 9	13	10	10	4 8	119	8	2 10 13

F.	I.	"
9	8	7
6	5	4
62	7	3 9 4

F.	I.	"
3	2	1
2	3	4
7	2	8 11 4

F.	I.	"
5	6	7
8	9	10
48	11	2 8

Note. If the number of feet is large, instead of multiplying by inches and seconds, you may take parts with them.

EXAMPLES.

	F.	I.	"		
	76	3	9		
	84	7	11		
76× 4=	304	0	0		
76× 4=	608	0	0		
3×84=	21	0	0		
9×84=	5	3	0	′′′	
6 ½	38	1	10	6	
1 ⅙	6	4	3	9	′′′′
6 ½	3	2	1	10	6
3 ½	1	7	0	11	3
2 ⅓	1	0	8	7	6
	6460	7	1	8	3

F.	I.	"
87	3	4
18	1	7
1582	6	2 3 4

F.	I.	"
64	3	7
27	2	6
1749	5	5 11 6

F.	I.	"
49	3	1
48	1	2
2369	1	5 7 2

F.	I.	"
71	3	6
92	1	7
6568	2	10 6 6

F.	I.	"
71	2	6
81	1	8
5777	9	2 2

F.	I.	"
56	1	8
97	3	9
5463	0	2 3

F.	I.
756	1
184	2
139287	1

F.	I.	"
371	2	6
181	1	9
67242	10	1 4 6

F.	I.	"
487	11	10
186	10	11
91209	4	2

A DECIMAL TABLE OF INCHES AND SECONDS.

I.	S.	decimal.	I.	S.	decimal.	I.	S.	decimal.	I.	S.	decimal.
	1	.006944	1	1	.090277	2	1	.173611	3	1	.256944
	2	.013888		2	.097222		2	.180555		2	.263888
	3	.020833		3	.104166		3	.1875		3	.270833
	4	.027777		4	.111111		4	.194444		4	.277777
	5	.034722		5	.118055		5	.201388		5	.284722
	6	.041666		6	.125		6	.208333		6	.291666
	7	.048611		7	.131944		7	.215277		7	.298611
	8	.055555		8	.138888		8	.222222		8	.305555
	9	.0625		9	.145833		9	.229166		9	.3125
	10	.069444		10	.152777		10	.236111		10	.394441
	11	.076388		11	.159722		11	.243055		11	.326388
1	0	.083333	2	0	.166666	3	0	.25	4	0	.333333

I.	S.	decimal.	I.	S.	decimal.	I.	S.	decimal.	I.	S.	decimal.
4	1	.340277	5	1	.423611	6	1	.506944	7	1	.590277
	2	.346222		2	.430555		2	.513888		2	.597222
	3	.354166		3	.4375		3	.520833		3	.604166
	4	.361111		4	.444444		4	.527777		4	.611111
	5	.368055		5	.451388		5	.534722		5	.618055
	6	.375		6	.458333		6	.541666		6	.624999
	7	.381944		7	.465277		7	.548611		7	.631944
	8	.388888		8	.472222		8	.555555		8	.638888
	9	.395833		9	.479166		9	.5625		9	.645833
	10	.402777		10	.486111		10	.569444		10	.652777
	11	.409722		11	.493055		11	.576388		11	.659722
5	0	.416666	6	0	.5		0	.583333	8	0	.666666

I.	S.	decimal.	I.	S.	decimal.		S.	decimal.	I.	S.	decimal.
8	1	.673611	9	1	.756944	0	1	.840277	11	1	.923611
	2	.680555		2	.763888		2	.487222		2	.930555
	3	.6875		3	.770833		3	.854166		3	.9375
	4	.694444		4	.777777		4	.861111		4	.944444
	5	.701388		5	.784722		5	.868055		5	.951388
	6	.708333		6	.791666		6	.874999		6	.958333
	7	.715277		7	.798611		7	.881944		7	.965277
	8	.722222		8	.805555		8	.888888		8	.972222
	9	.729166		9	.8125		9	.895833		9	.979166
	10	.736111		10	.819444		10	.902777		10	.986111
	11	.743055		11	.826388		11	.909722		11	.993055
9	0	.75	10	0	.833333	11	0	.916666	12	0	1.

The construction othe foregoing Table.

Let it be required to finwhat part of a foot one secon is in decimals.

1. One foot reduced into conds make 144 seconds.
2. The vulgar fraction withen be $\frac{1}{144}$ of a foot.
3. Divide the upper termy the lower, and the quotien thence arising will be the anwer.

144)10,0000(.006944+
864
1360
1296
640
576
640
576
64

After the same manner the whole table is made, except the case of inches only; as in the case of one inch, whe the vulgar fractions will be $\frac{1}{12}$ of a foot. Divide the upp term by the lower, as before, and you have the quotient the answer,

12)1.00000(.083333+

Note 1. If the given part of a foot consists only of inch the divisor need be no more tha 12, because 12 inches m 1 foot.

2. If the given part of a fot consists of seconds only, inches and seconds together, thn 144 must be the divisor; cause 144 seconds make 1 foot.

The use of the pregoing Table.

Let the first example in multiplication be given, viz.

F I.
Multiply 7 2
By 7

Look in the table for 3 inches, against which stands .2 Again look for 7 inches, against which stands .583—He it follows, that 7*f.* 3*i.*=7.25*f.* and 4*f.* 7*i.*=4.583333*f.*

Note. It is common in any large number of decimals, to trouble in the operation, by making one of them one part la which cuts off all the following figures; thus 4.583333*f.* *be made* 4.584*f.*

Multiply 7.1
By 4.58

290
5800
3625
2900

32.234
12

F. I.
Ans. 33 2 9

2.80
11

9.69

Again; Let the first example feet, inches, and seconds, be given, viz.

I. "
Multiply 3 2
By 7 3

Look in the table for 3*i*. 2*s*. against them you will find 263888; also in the same table, 7*i*. 3*s*. and against them you will find, 604166; then by shortening the decimals,

Multiply 264
By 041

264
256
435
736

11.61821
12

7.816
2

9.92
2

10.94
2

11.60

Ans. 11*f*. 7*i*. 9″ 10‴ 11⁗ the difference being inconsiderable.

DIVISION OF DUODECIMALS.

F.	I.	"	F.	I.	"	F.	I.	"		
2)146	7	10(	73	3	1(	11)128	4	5(	'''	''''
3)761	4	11(				12) 76	8	7(		
4)963	2	10(				7) 86	3	7	4	8(
5)186	1	10(				8) 98	4	6	6	1(
6) 76	3	11(				9) 86	2	1	1	7(
7)186	1	10(				10) 47	3	4	9	1(
8)712	8	4(				11) 96	2	7	11	4(
9)912	3	5(				12) 83	1	6	9	10(
10)861	11	10(				12) 78	10	11	10	9(

Note 1. It very seldom happens that the divisor consists of more than one denomination; yet because such divisors may sometimes offer themselves, I will give a few for the reader's satisfaction. which must be wrought after the manner of Long Division, and they serve also as proofs to some of the foregoing examples in Multiplication.

2. This sort of division often admits of two figures at once in the quotient.

EXAMPLES.

F.	F.	I.	"	F.	I.
4	)33	1	6(	7	6.
4	5×7=	30	11		
		2	2	6	
4	5×6=	2	2	6	
				0	

Note. If the feet of the quotient consist of more than one figure, you must consider,

1. How many figures are required in the feet by common division.

2. If the feet required consist only of 2 figures, you must multiply the divisor by the first figure (which stands in tens place) with a cypher annexed. But,

3. If the feet required consist of three figures, you must multiply the divisor by the first figure (which stands in hundreds place) with two cyphers annexed: and the next figure in the quotient (which stands in tens place) with one cypher annexed.

4. Whatever the product is in feet and inches, let it be placed under the dividend in such manner, that feet and inches may stand under feet and inches, and units under units.

5. With regard to the number of feet in the dividend, you must proceed according to the common method of Long Division, *till* you have obtained the number of feet required in the *quotient.*

	F.	I.	F.	I.	"	F.	I.
	184	8)	235.45	0	0	(127	6
184	8 ×	100=	184.66	0			11
			507.8	0			
184	8 ×	20=	369.3	4			
			1385	0			
184	8 ×	7=	1292	8			
			92	4	0		
184	8 ×	6 inch.=	92	4	0		
					0		

	F.	I.	F.	I.	"	F.	I.
	48	9)	3733	5	3	(76	7
48	9 ×	70=	3412	6			
			320	11			
48	9 ×	6=	292	6			
			28	5	3		
48	9 ×	7in.=	28	5	3		

	F.	I.	F.	I.	"	F.	I.
	79	8)	3100	4	4	38	11
79	8 ×	30 =	2390				
			710	4			
79	8 ×	8	637	4			
			73	0	4		
79	8 ×	11in. =	73	0	4		
					0		

F.	I.	F.	I.	"
6	7)	31	3	3(
8	10)	87	7	2(
8	9)	83	10	3(
12	9)	130	8	3(
11	5)	140	0	8(
9	3)	116	4	9(

F.	I.	F.	I.	"
39	8)	1847	9	8(
84	6)	6048	9	6(
19	10)	1518	10	10(
95	2)	8017	9	6(
26	8)	1896	9	8(
18	8)	673	6	8(

F.	I.	"	F.	I.	"	‴	⁗	F.	I.	"
1	7	3)	11	7	9	11	6	(7	3	2
			11	2	9					
				5	0	11				
				4	9	9				
					3	2	6			
					3	2	6			
							0			

F.	I.	"	F.	I.	"	‴	⁗	F.	I.	"	F.	I.	"	‴	⁗
7	3	8)	62	6	7	9	(	12	3	10)	119	8	2	10	10
5	10	6)	28	7	7	0	(	9	8	7)	62	7	3	9	4
7	1	9)	55	2	9	3	9	3	2	1)	47	2	8	11	4
3	9	2)	13	10	10	4	8	8	9	10)	46	11	2	8	10

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